VEMBER 27, 1961
Volume 50, No. 24

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AMERICAN DYESTUFF REPORTER

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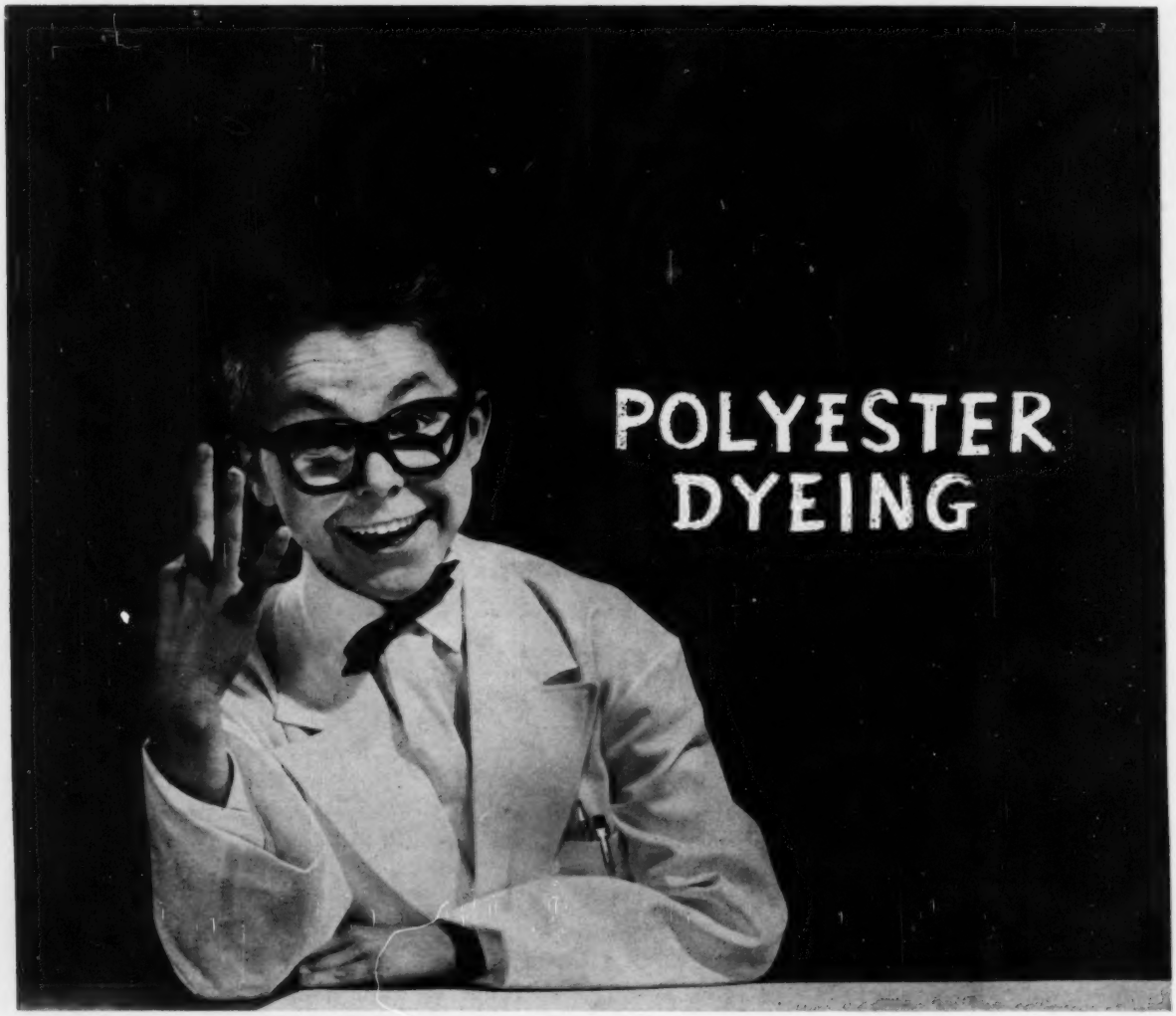

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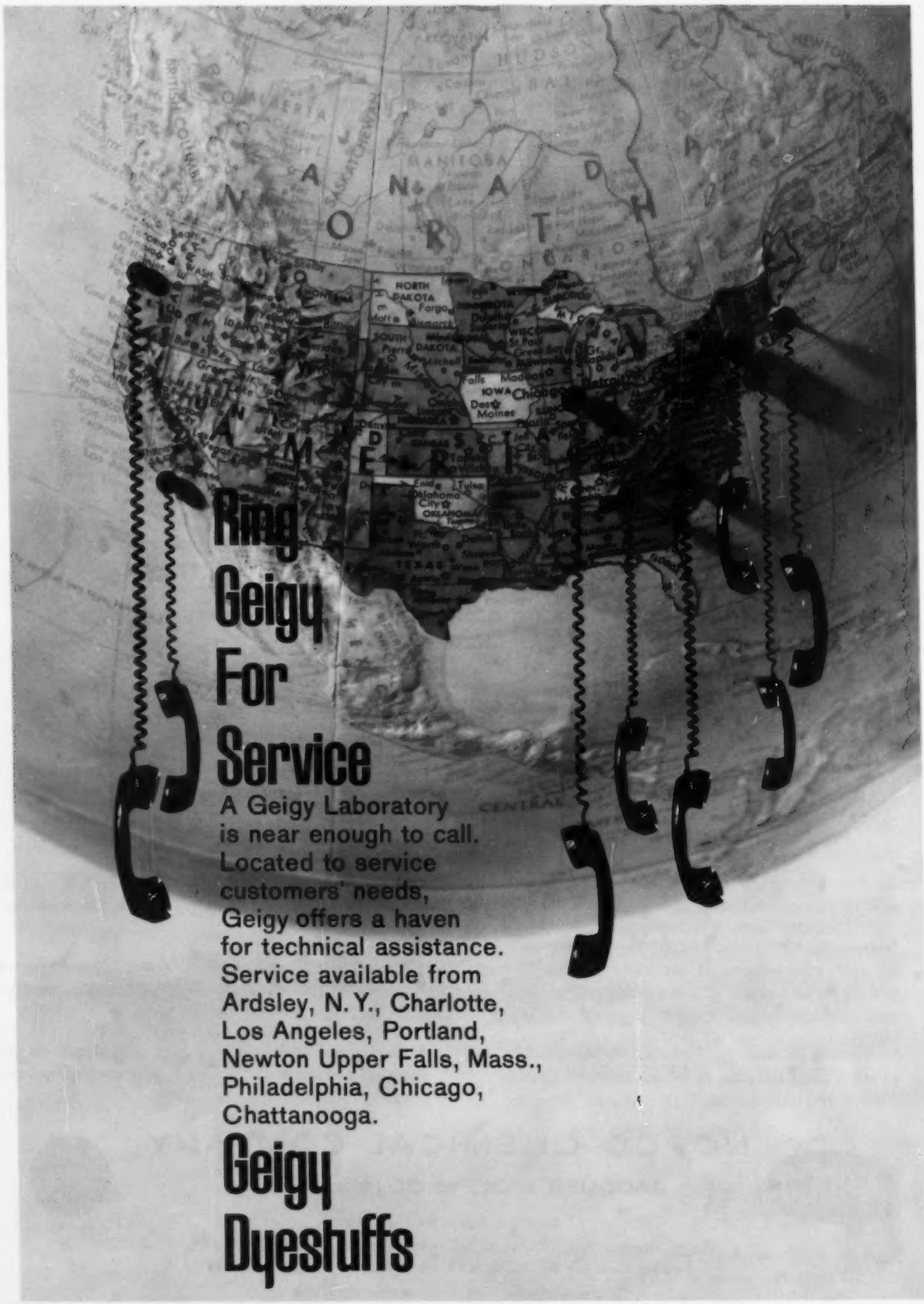

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specially contributed

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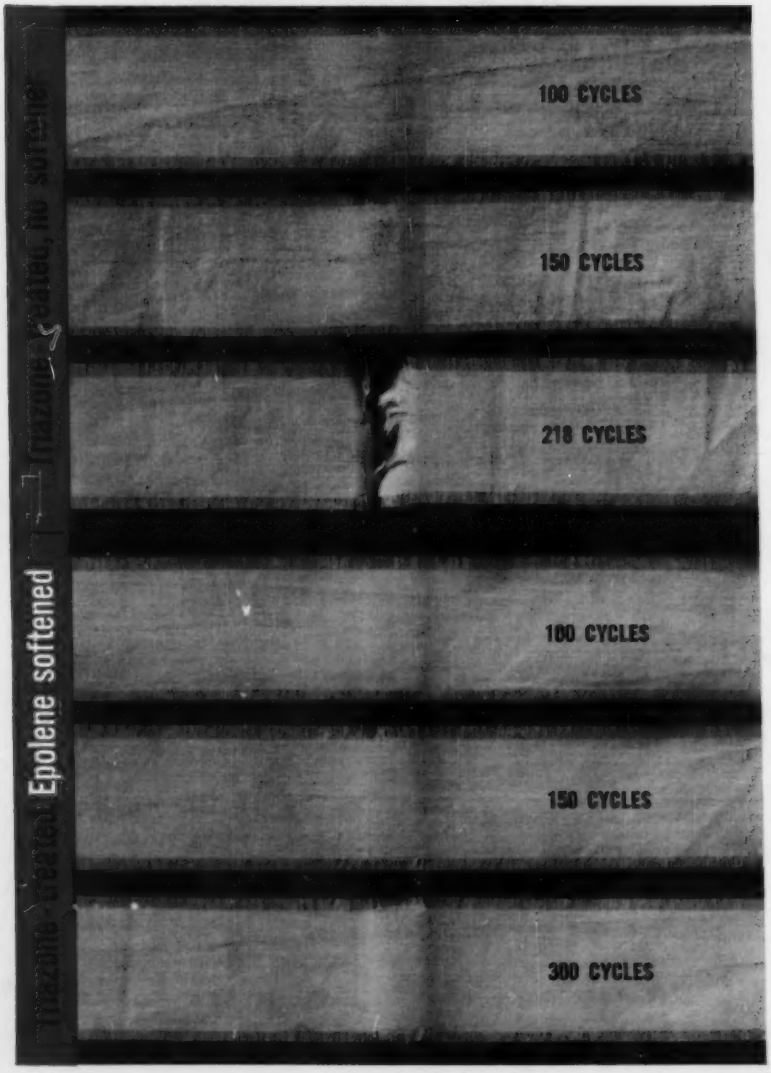
The Stoll-Flex Abrasion Test demonstrates the increased strength given to a resin-treated cotton fabric by an Epolene softener.



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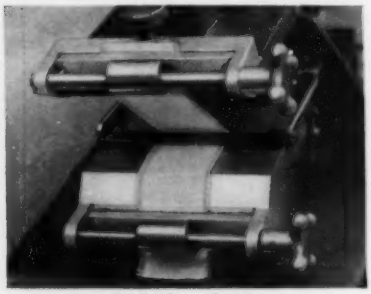

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ADR OPEN FORUM

(A page devoted to reader comments, general comments by the staff of *American Dyestuff Reporter*, and "letters to the editor". Names of those submitting material for this page will be withheld on request. Address letters to "Open Forum," American Dyestuff Reporter, 44 East 23rd St, New York 10, NY).

November 27, 1961

"BATTLE LINES IN FOREIGN TRADE— A YEAR OF DECISION"

THE forthcoming session of Congress bids fair to offer one of the biggest fights in years over foreign trade policy. With the expiration of the President's authority to reduce tariff duties in June 1962, a new policy is needed to fill the vacuum. The Administration obviously contemplates industry dislocation in offering a program of Federal aid for affected industries.

How the new trade policy will shape up is, of course, of major interest to many industries, and of special importance to the textile industry and the synthetic organic chemical industry.

In this issue of *American Dyestuff Reporter*, beginning on page 36, appears the text of an address by Crayton K Black, assistant manager, trade relations, E I duPont de Nemours & Co, Inc, which was presented before the American Association of Textile Chemists and Colorists at its 1961 Convention in Buffalo, NY, in September. Entitled "Imports—and Your Job", the article, geared to those in the textile industry, commands careful reading and consideration.

Earlier this month, members of the Synthetic Organic Chemical Manufacturers Association were warned by Dr Black, chairman of SOCMA's International Relations Committee, that foreign trade policy must not be so liberalized that foreign nations become the sole or principal source of essential products.

"The synthetic organic chemical industry is a key industry essential to the national security. It must continue a healthy existence or we will repeat our World War I experience," Dr Black cautioned.

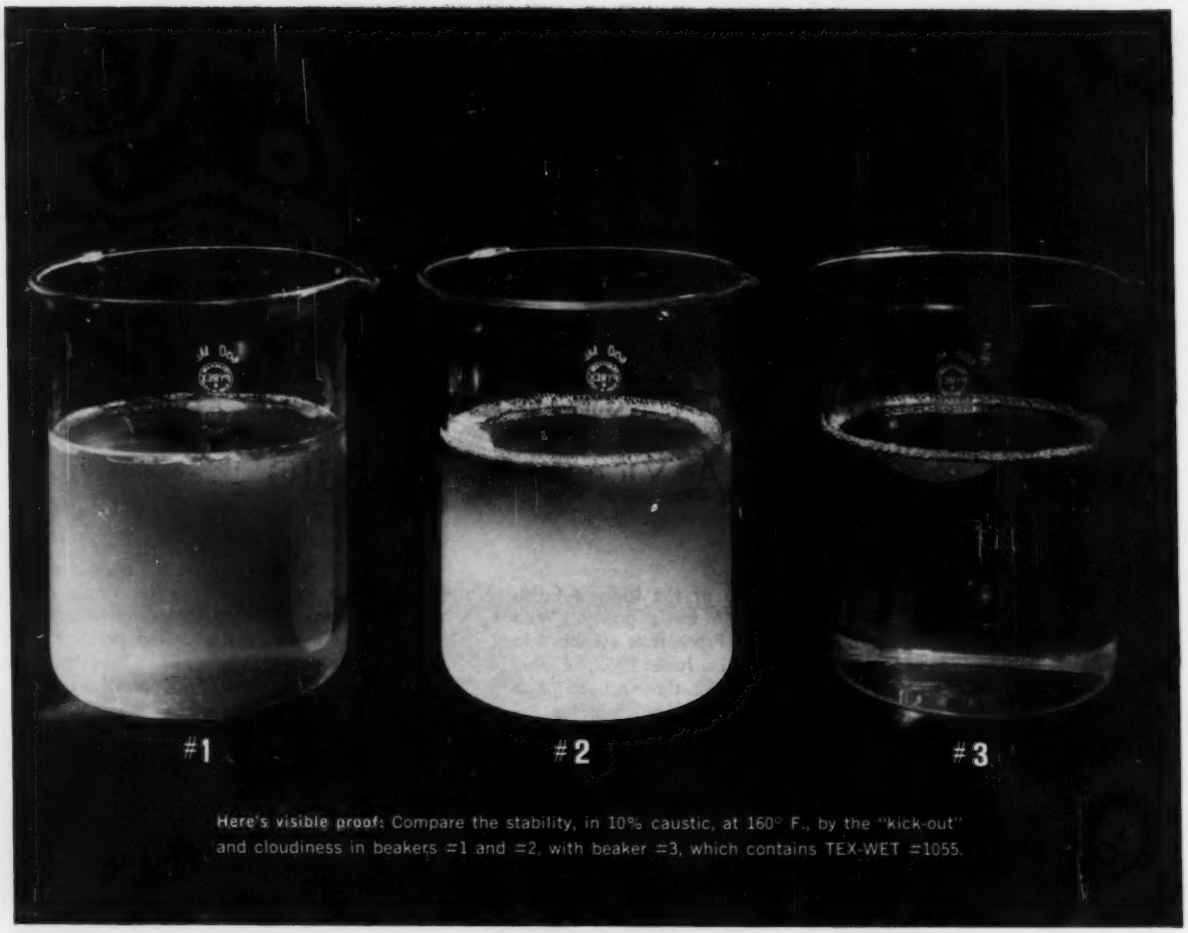
"In our industry it is particularly important to sustain the research necessary for further growth. Scientists cannot be mothballed for use in an emergency but must be given challenging jobs on a continuing basis," he added.

Dr Black said that indications are that when the present Trade Agreements Act expires in June 1962, the Administration would like to have a law that would give the President authority to reduce tariffs on an across-the-board basis. The products of the synthetic organic chemicals industry are so interrelated that curtailment of production and sales of one product included in an across-the-board tariff reduction could immediately spread through a whole chain of related organic chemical products, many of them essential to the national security. Therefore, he continued, SOCMA advocates selective tariff legislation in which each product is judged on its importance to the economic well-being and security of the United States.

Many spokesmen on foreign trade policy today insist that it is only by lowering our present tariffs (already low) that we can expect to do business abroad, Dr Black said. He called for a critical look at this theory.

With the renewal of the Foreign Trade Agreements Act coming up, SOCMA has made a careful study of the foreign trade situation as it affects the synthetic organic chemical industry, Dr Black explained. Important among the principals which the Association supports are: essentiality of the synthetic organic chemical industry to the national security; tariffs or other controls which assure fair competition; tariffs and/or quotas on a selective basis; the right of Congress to regulate foreign trade; in the light of the formation of regional trading blocs which are discriminatory against nonmembers, the elimination of the most favored nation concept; a strengthened Tariff Commission to administer and execute the policy of the Congress by findings and recommendations to the President; the free market approach for such adjustments as import competition may require instead of subsidies.

SOCMA's membership represents over 90%, in terms of dollar volume, of the synthetic organic chemical industry.



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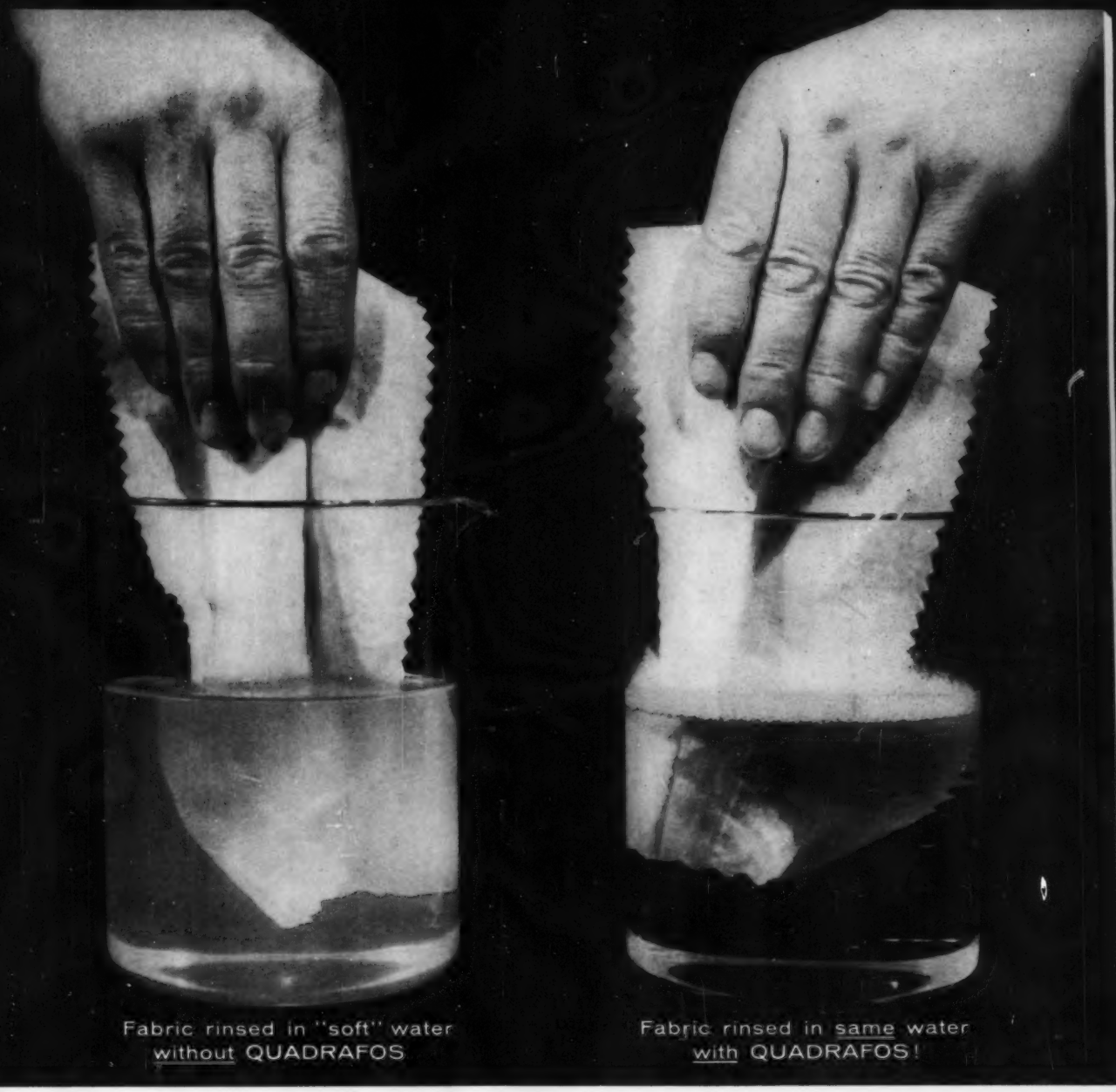

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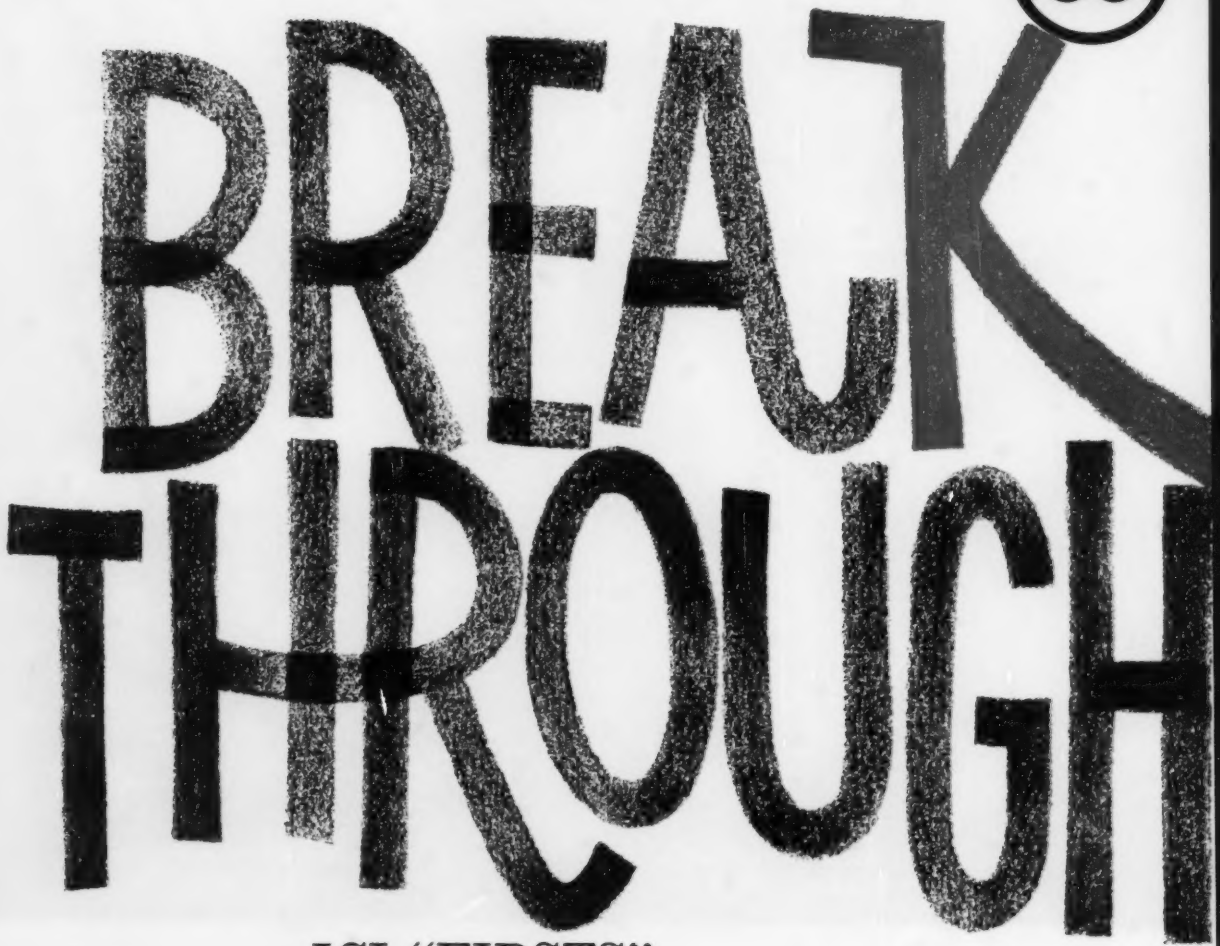

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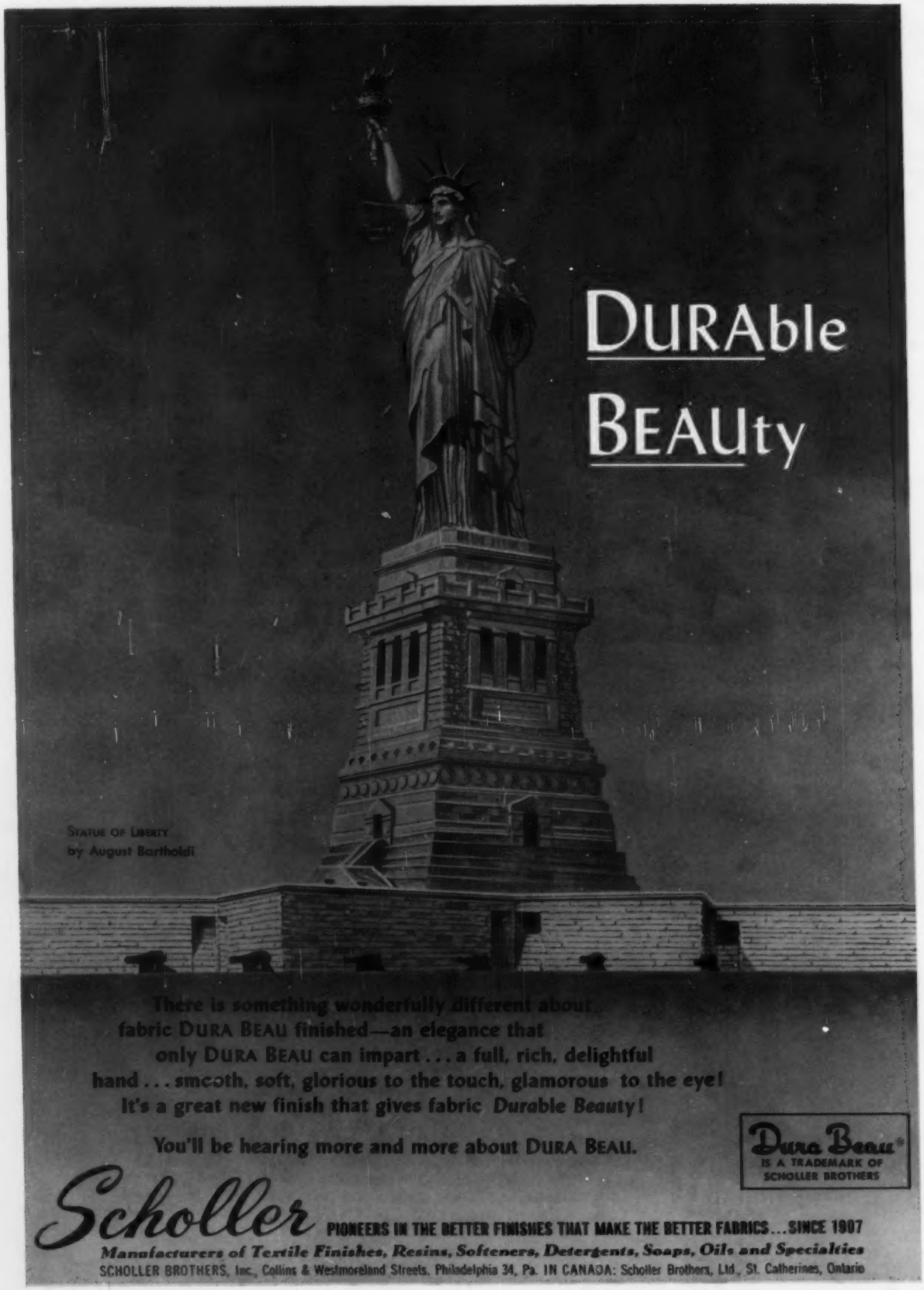
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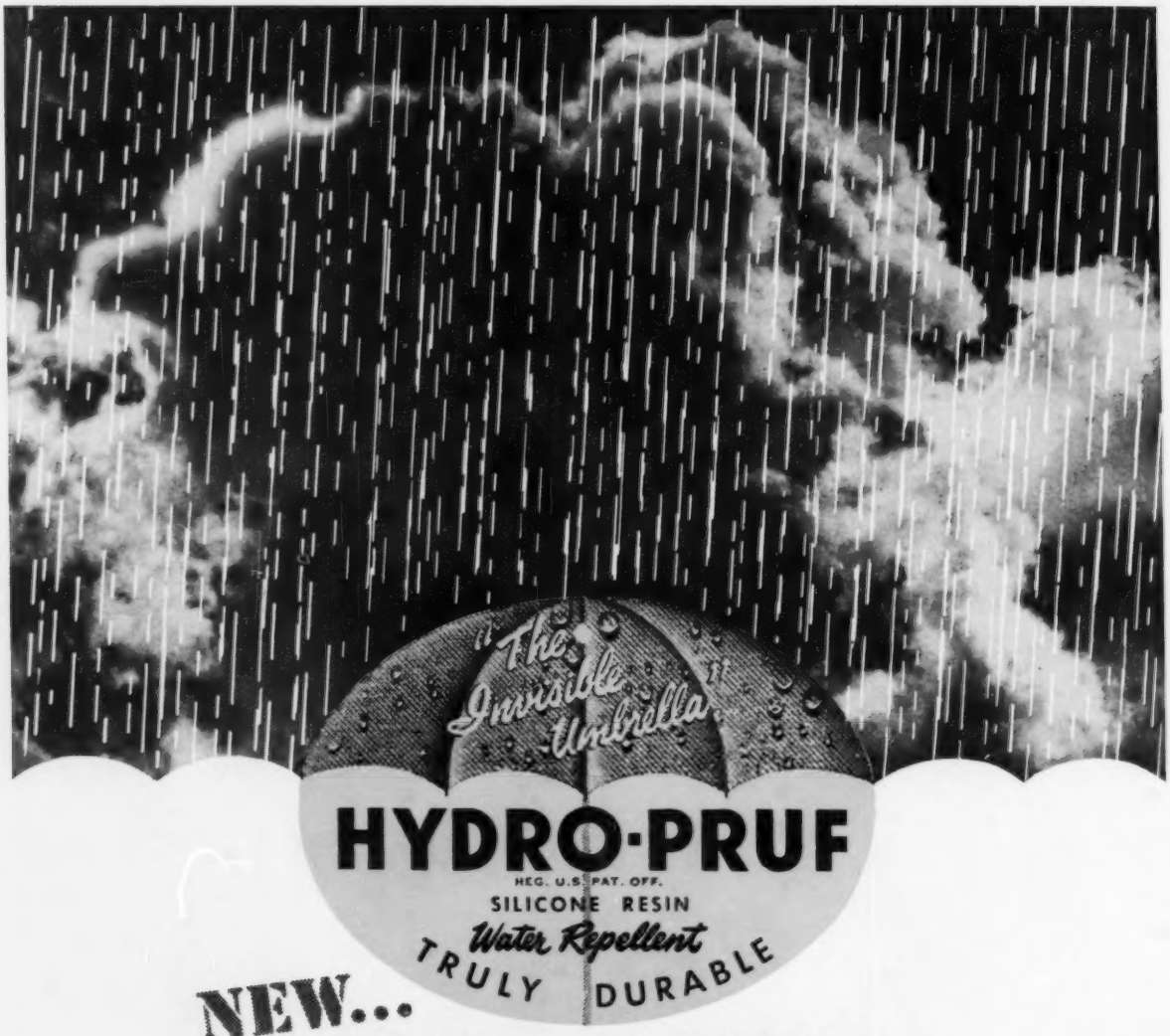

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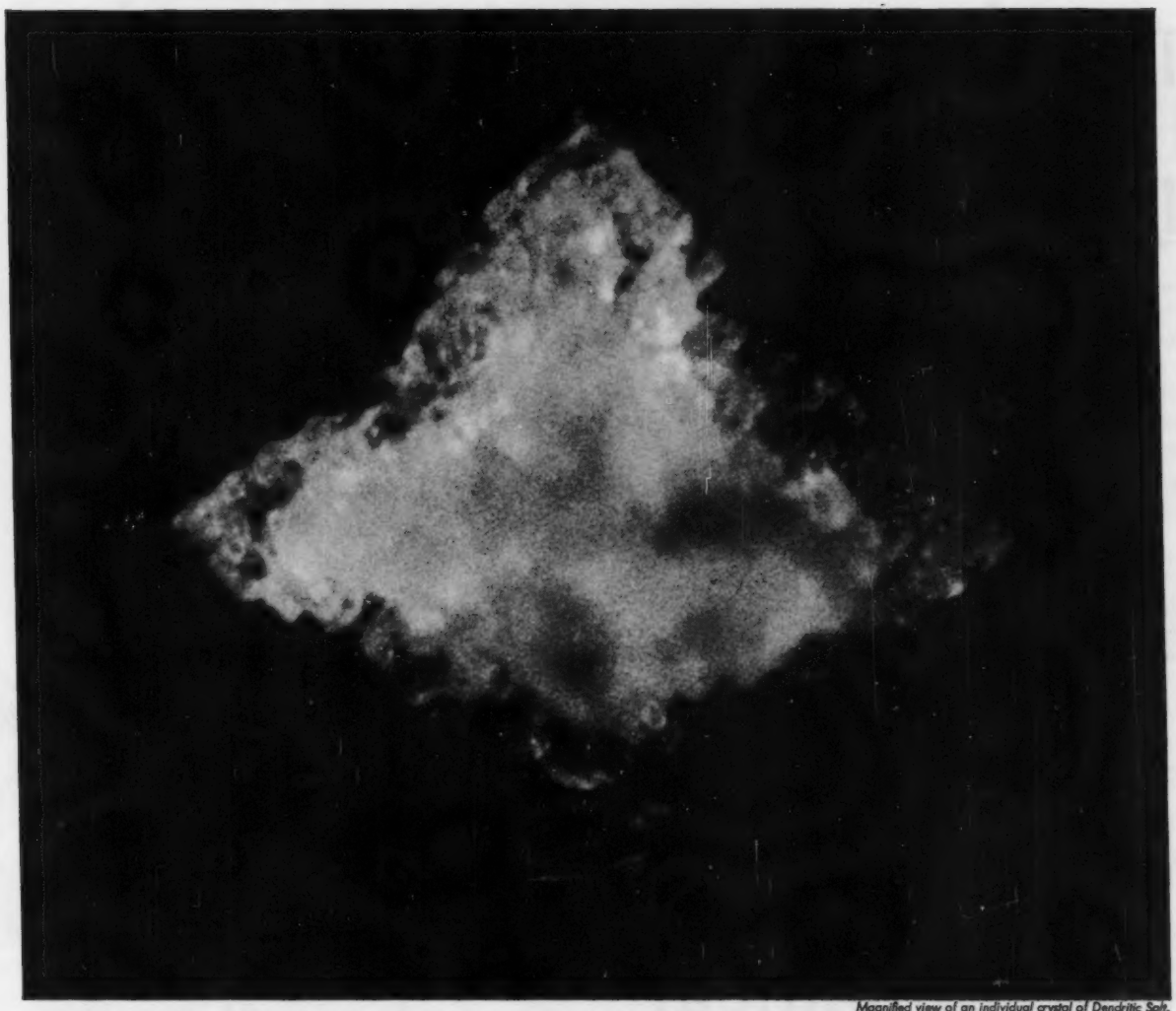

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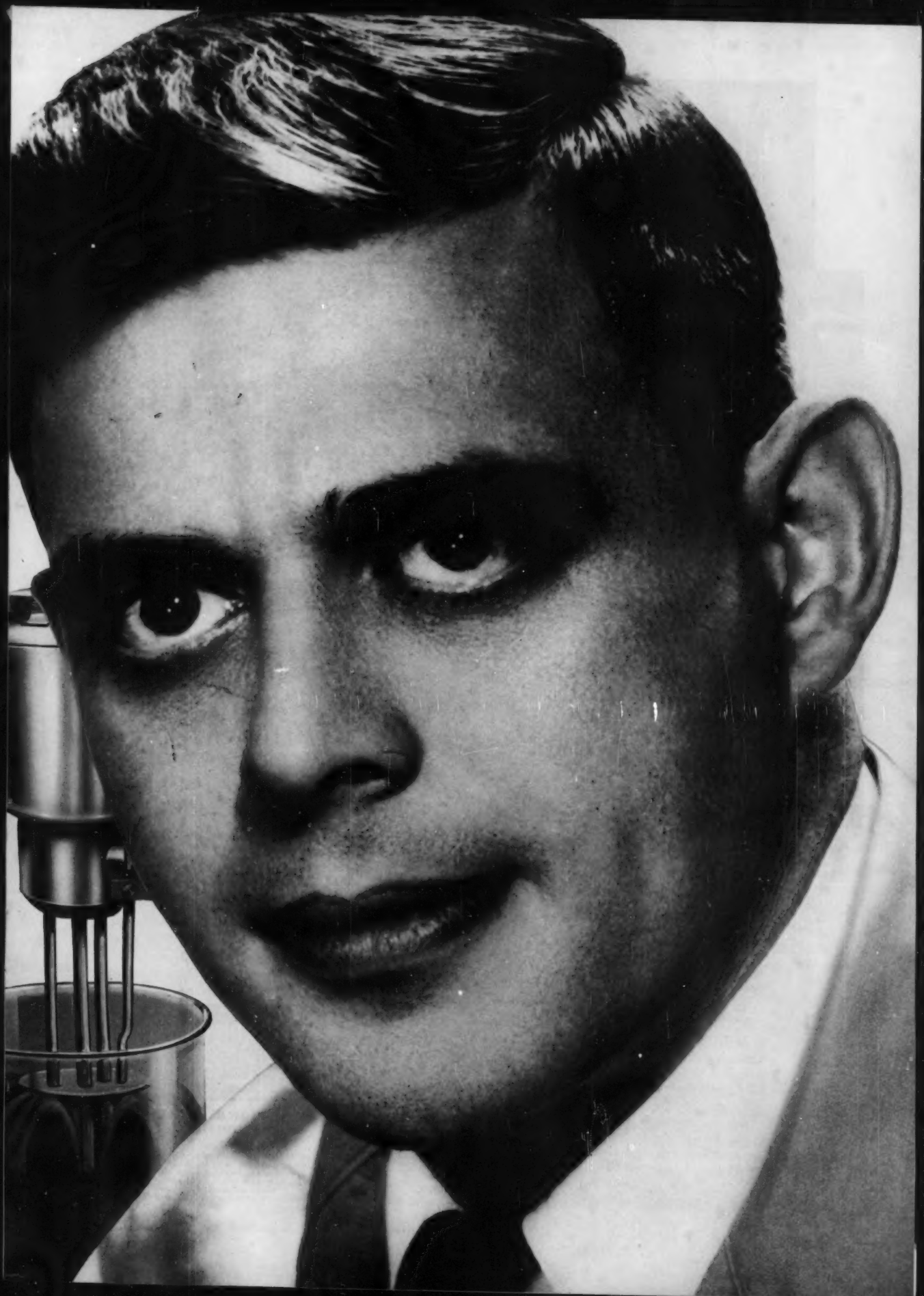

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MERCERIZATION OF COTTON FIBERS WITHOUT TENSION[1]

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Work was undertaken to determine the physical properties and chemical behavior of mercerized cotton fiber produced by tensionless procedures.

Studies were first made relative to the most optimum concentration of caustic soda for tensionless mercerization. No further changes in cotton fiber properties were found beyond a concentration of sodium hydroxide of 16%, the effects being determined by changes in length, denier, strength, and elongation. The fiber breaking load and the denier were increased but the tenacity of the single fibers was decreased. The maximum shrinkage was about 15%, and the increase in elongation at break was from 7.5% for the untreated fiber to 12% for the mercerized fiber.

It was found that card sliver was the best form in which to mercerize the fiber, and a manufacturing organization for producing yarn from the mercerized sliver was developed. The yarn spun from mercerized sliver showed higher elongation and better strength and appearance than that spun from untreated cotton. The increase in elongation of the single fibers mercerized without tension was not completely utilized in the yarn made from these fibers, the maximum elongation of the yarn being 10.7%. Studies of the recovery behavior revealed that the yarn made from the untreated fiber was superior to the yarn made from the mercerized sliver. In all respects the same conclusions were reached with regard to yarn properties, whether singles yarns or ply yarns were used.

Both knitted and woven fabrics were made. For gray fabrics, the warp crimp of the untreated and the fiber mercerized yarns was much higher than the yarns skein mercerized both with and without tension. The filling crimp of the untreated was the highest among the four samples.

For greige fabrics in the warp direction, the elongation at break of skein mercerized both with or without tension was less than the untreated, while the fiber mercerized treatment produced a fabric which had the highest elongation. In the filling direction, the fabric made from yarn that was skein mercerized without tension, and the one made from fiber mercerized yarns possessed higher elongation at break than the untreated material. No definite conclusions could be drawn relative to the comparative strengths of the various fabrics. Considering the data obtained by different methods of evaluation, strengths appeared to be very nearly the same for all materials.

The receptivity to dyes and resins of the fabrics was determined. As in the case of the other properties cited for the mercerized materials, there was no advantage gained with respect to resin treatment or dyestuff receptivity by stock mercerization.

INTRODUCTION

THE mercerization of cotton has been carried out on a commercial scale in this country and abroad for approximately sixty years. The effects of concentrated caustic solutions on cotton were first discovered by Mercer in 1844, and following the observation of Lowe in 1890 that a silk-like luster developed if the cotton were held under tension to prevent shrinkage, the commercial process of mercerization was developed. The process is used almost entirely to produce a lustrous material, although certain other desirable characteristics are introduced simultaneously, eg, increased strength and increased ability to absorb dyes.

At least three important permanent changes can be brought about in the properties of cotton fibers by mercerization. These are: 1) an increase in diameter or permanent swelling, 2) a decrease in length or shrinkage (when tension is not employed), and 3) an increase in the amount of amorphous material in the fine structure of the fiber at the expense of the crystalline. This last change can, theoretically at least, cause significant changes in the physical and chemical properties of the fiber, particularly with regard to elongation characteristics and the susceptibility to all types of wet-finishing treatments. Generally, a greater elongation and a greater absorption of dyestuffs, for example,

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are observed in those fibrous materials that contain larger percentages of the so-called amorphous areas. Indeed, the increase in amorphous material brought about by the mercerization of cotton accounts for the greater absorption of dyes, water, etc, by the mercerized fiber.

The tension normally used in mercerization tends to restrict shrinkage, swelling, and the conversion of crystalline areas to amorphous ones. Or, remembering that based on the present theories of the structure of cellulosic fibers there is no sharp line of demarcation between a crystalline area and an amorphous area, tension would tend to limit the decrease in degree of crystallinity, as well as orientation, of the cotton during treatment with sodium hydroxide. Under a given set of conditions, therefore, it would appear that, if no tension were applied, the maximum decrease in degree of crystallinity would be obtained; at the same time a decrease in orientation of crystallites might be expected. From a consideration of the foregoing points, it would appear that the maximum effect of caustic soda would be obtained on fibers themselves where no restrictions on swelling or shrinkage would be present.

Apparently, only a limited amount of experimental work has been done on the mercerization of cotton without tension, especially in forms other than yarns or fabrics. Whether difficulties in the processing of mercerized fibers into yarns, or the lack of interest in producing fabrics from mercerized stock, in which case little luster is obtained, has led to this situation is not clear. Theoretically, it seems that definite advantages might be offered by cotton fabrics made from mercerized fiber, the properties of which might better meet some consumer requirements. Thus, the present work was undertaken to determine the physical properties and chemical behavior of mercerized cotton fiber produced by tensionless procedures. More specifically, the prinicipal objects were to determine 1) whether the tensionless mercerization of cotton yielded fibers with a higher degree of elongation, elasticity, and receptivity to dyes and other wet-finishing treatments than is the case with unmercerized fibers or fibers mercerized in the form of yarn or fabric, under tension or otherwise; and 2) whether comparatively superior yarns and fabrics with respect to elongation, elasticity, and receptivity to dyes and wet-finishing treatments could be produced.

In the present work, it was necessary to consider initially the general aspects of the subject of mercerization. The main points of interest resolved themselves as follows:

1) The reaction mechanism and the nature of the reaction product of alkali upon cellulose are both still open to some question.
2) As revealed by X-ray analyses, the greater the degree of mercerization of a cellulosic fiber, the greater the extent of intramicellar rearrangement of the cellulosic chains, with the result that there is less orientation of these chains with respect to each other and a decrease in the degree of crystallinity accompanied by an increased tendency for absorption of compounds such as water, alkali, and dye, by the fiber.
3) Thorough mercerization, as evidenced by maximum fiber shrinkage and cross-sectional swelling, takes place in the presence of a sodium hydroxide solution of about 16% (35° Tw) concentration. At this stage X-ray analyses reveal an entirely new crystalline lattice for cellulose. Transition from a native-cellulose X-ray pattern to a mercerized-cellulose X-ray pattern starts at a concentration of about 9% and full mercerization, judged by this criterion, is obtained at 16%.
4) The maximum degree of mercerization for any given temperature is realized at a lower caustic strength than if mercerization is carried out at a higher temperature. Consequently, the lower the temperature, the greater the degree of mercerization for any given strength of caustic. Within limits, therefore, caustic strength and temperature might act as interchangeable factors in the production of comparable, if not identical, mercerizing effects. Thus, for example, the same effect is obtained with 18 to 25% solution at 59° to 68°F as 12.5 to 16% at 36° to 48°F and 6.5% at 14°F.
5) Mercerization of cellulosic fibers is of a non-reversible nature. For example, fibers first immersed in concentrated solutions of caustic swell upon subsequent dilution of the solution; fibers immersed first in dilute solutions remain greatly swollen at higher concentrations. Fibers mercerized at a temperature of 88°F enlarge in cross-section as the temperature is dropped to about 57°F; reversing the conditions of the experiment causes very little decrease in cross-sectional swelling during the entire process.
6) During treatment with alkali, heat is liberated. The more concentrated the caustic soda solution, the greater the amount of heat evolved; eg, with 5.04% and 18.14% sodium hydroxide, 12.96 and 30.56 cal/g are liberated, respectively.

The literature is sufficiently rich in documentation regarding the mercerization under tension (and, to a certain extent, without tension) of cotton yarns and fabrics. It has been pointed out that, in the study of effects of mercerization on cotton fibers themselves, there was little to be gained by working with yarns and fabrics in that the measurements obtained therewith reflected the influence of a number of factors which cannot be separated. Thus, Collins and Williams (*1*), Nodder and Kinkead (*2*), Williams and Alexander (*3*), and Willows (*4*) have described their results obtained when single fibers were subjected to mercerizing conditions. They found a maximum decrease in length at a concentration of 14% sodium hydroxide, and up to a concentration of 10% fiber elongation was noted. Under a slight tension, maximum shrinkage was observed at 16% sodium hydroxide.

It seemed desirable in the present work to reinvestigate the optimum concentration of caustic and the temperature required to obtain the maximum degree of swelling of the cotton being used in this work. These studies included the development of an appropriate method for mercerizing cotton fiber without tension, studies of the effect of selected wetting agents on the rate of mercerizing, and the evaluation of the effects of various concentrations of sodium hydroxide on the important properties of the fibers.

In the present report there is included also a description of the mechanical processing of mercerized fibers, and of the properties of yarns and fabrics produced therefrom, and a study of the receptivity of mercerized materials to dyes and resins.

MATERIALS AND METHODS

For the experimental work on this project, two bales of Mississippi Delta Cotton 1-1/16-inch staple length and one bale of Carolinas cotton 1-1/32-inch staple length of known history were obtained. Information relative to the temperatures and precipitation during the period in which the cotton was grown is available.

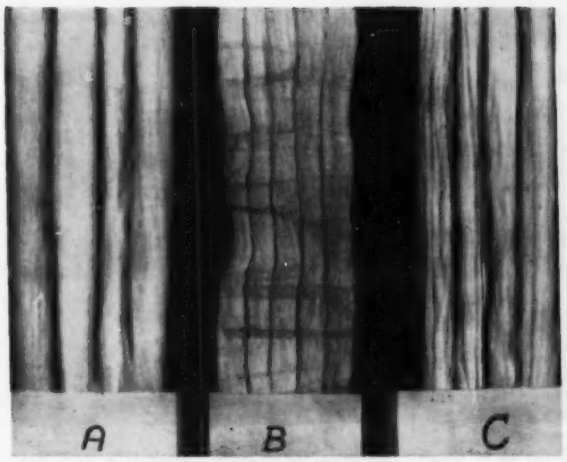

Figure 1
Sliver lap untreated (A), mercerized (B), and redrawn (C)

PRELIMINARY OBSERVATIONS—— The general procedure used in all of the experiments referred to below was as follows. A one-pound-sample package-dyeing machine was used in the preliminary experiments as a means of circulating the caustic soda without disturbing the mass of fibers themselves. In this way, thoroughness of penetration of the mercerizing liquors throughout the bulk of the fibers could be obtained, and difficulties in the subsequent processing brought about by entanglement of the fibers could be minimized. A sample of sliver lap 125 to 130 grams in weight was wound by hand around a 1⅝-inch stainless-steel perforated tube to which was added a specially built circular removable flange on either end. The tube was fastened onto the package machine by means of an adapter, and the circulation was outside to inside to help protect the package from disruption. The volume of circulating liquor employed was 6¾ to seven liters, to which was added 10 grams of Tergitol Anionic 08[1] (except that for the 23% level of concentration, Tergitol EH was used). As the strength of the sodium hydroxide solution was progressively increased from treatment to treatment, the time of reaction was also increased, the upper limit being one hour. The bath was then dropped and the sample subjected to a continuous overflowing rinse for about 20 minutes, following which the circulating waters were checked with brom-cresol purple, acidified with acetic acid until the indicator turned yellow, and then immediately brought back to a pH of about 6.5 to 7 with soda ash. The indicator was washed off, the sample removed, hydroextracted, and dried. In all cases the initial temperature of mercerization was 86° ± 2°F. The maximum temperature of mercerization, with flow of room-temperature water in the surrounding jacket, varied from 110° to 130°F, the stronger caustic producing the higher temperature.

Mercerization experiments were carried out using raw stock, picker lap, sliver, sliver lap, and roving. Considering all the factors involved, including processibility of the mercerized materials into yarns, it was concluded that the best results would be obtained by mercerizing the fiber in the form of a card sliver. No channeling was detected during the mercerization procedure, and the individual slivers in the lap retained their identity after drying. The lap was redrawn with very little difficulty. The lap untreated, mercerized, and redrawn, designated as A, B, and C, respectively, is shown in Figure 1. It was observed that the strength of the sliver in the lap showed a tendency to increase with the degree of mercerization.

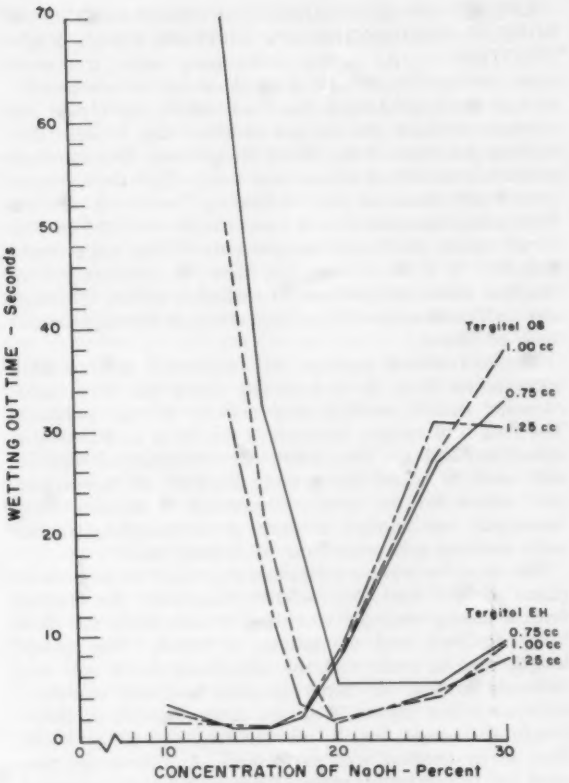

Figure 2
Effect of wetting agents

The effects of wetting agents with sodium hydroxide were studied, using sliver. Because of compatibility with sodium hydroxide, only two were chosen. They were Tergitol Anionic 08 and Tergitol EH. Three concentrations of each penetrant were added to commercial caustic soda solutions and in some cases to chemically pure sodium hydroxide solutions, the concentrations of the latter varying from 10% to 50%.

The efficiency of the penetrant was recorded as the time required for the fiber bundle to wet out completely. The tests were performed using AATCC Tentative Test Method 43-52, Evaluation of Penetrants for Mercerization. The wetting times for the penetrants are shown in graphic form in Figure 2. Below caustic soda concentrations of 18%, Tergitol Anionic 08 was the most effective. Above this concentration, Tergitol Penetrant EH was the more effective. Neither penetrant was effective in caustic-soda solutions above 30%. The material used in subsequent work was, therefore, dependent upon the concentration of caustic being employed for the mercerization.

The chemically pure caustic soda solutions containing the same percent solids as the commercial caustic soda gave wetting times with each penetrant that showed it to be definitely more concentrated than the commercial product. This was to be expected because the commercial caustic contained inactive ingredients, such as carbonates.

[1]Mention of companies and trade products does not imply that they are recommended or endorsed over other companies and trade products not mentioned.

EFFECT OF DIFFERENT CONCENTRATIONS OF SODIUM HYDROXIDE ON COTTON FIBER PROPERTIES——As in the preliminary work, treatment with sodium hydroxide was done in a one-pound-sample package-dyeing machine, which circulated the solution through the sample of sliver lap without disturbing the mass of the fibers themselves. The standard procedure outlined above was used. The experiments performed were at the following levels of sodium hydroxide concentration in percent: 12—14—16—18—23. In all cases, the initial temperature of the experiment was 86° ± 2°F. It was felt that the relatively long reaction times selected were justified to insure thorough and uniform penetration of the solution throughout the mass of fibers.

The mercerized package was unwound, and samples were taken from three positions along the sliver axis, namely: inside, middle, and outside of the package. The length of sample for each of the three positions was about ten inches. The cotton-fiber mechanical blender was used to blend these three sections of mercerized card sliver for an even, representative sample. This technique was applied to each of the five lots treated with varying concentrations of caustic soda.

The samples were conditioned overnight in an atmosphere of 70°F and 65% relative humidity. An Instron tensile testing machine was used to determine the fiber breaking load and elongation at break. The gauge length was ½ inch, and the crosshead speed was one inch per minute. An Emerson oven was used to determine moisture regain. For the determination of fiber-length shrinkage due to mercerizing, the Suter-Webb fiber array method was performed. A Vibroscope was used for the determination of denier for the untreated and treated fibers. Twenty-five tests were conducted for each of the sample lots.

The optimum procedure for fiber mercerization was determined from the results of these experiments.

DEVELOPMENT OF A CONTINUOUS METHOD FOR SLIVER MERCERIZATION——It was obvious in working with the package machine that suitable quantities of mercerized lap could not be obtained by such a batch process. Thus, various ways of producing large quantities of the mercerized material were investigated. Of the procedures tried, a method that employed a screen to carry the sliver lap appeared the most promising.

The wash boxes of a continuous dye range were threaded with metal screening in the form of two continuous belts (Figure 3). These belts carried the sliver lap through the caustic mercerizing solution (approximately 23% sodium hydroxide solution containing 0.5% Tergitol Penetrant EH) in the box and then through a series of nine rinsing sprays. The wet sliver lap was squeezed as it came off the screens and piled into trucks. The machine was operated at slow speed so that the sliver lap was immersed in the caustic liquor for approximately one minute and then allowed to retain its caustic at full concentration for another minute before being washed by the first spray. The sandwich of the wire screens with the sliver lap between them was given a slight nip between every two sets of sprays.

To neutralize the material, the lap was rerun between the belts through the mercerizing range into a bath containing 1% acetic acid and then was rinsed through the series of nine sprays. The neutralized and rinsed sliver lap was squeezed as it came off the screens and piled into trucks. The wet neutralized lap was then extracted by passing it through a heavy nip of a two-roll pad where the moisture content was reduced to about 70%. This extracted sliver lap was then dried on cans at a slow rate of speed. About 3.5% oil (BDB) was applied to the stock prior to processing.

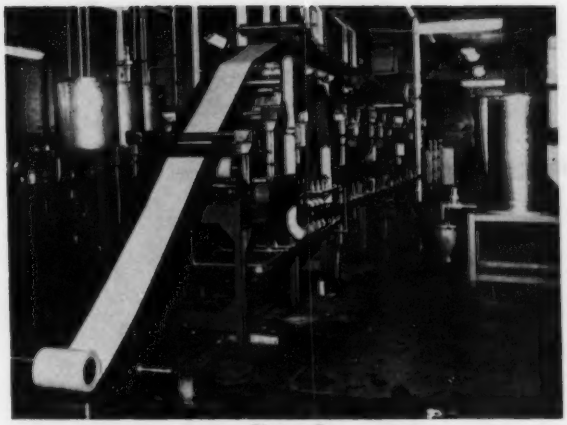

Figure 3
Continuous dyeing machine fitted with continuous belt for mercerization of sliver in lap form

Slow rates of speed were necessary to give sufficient time to thoroughly wet out the cotton and to allow the mercerizing action to take place. The cotton had to be supported between metal screens at all times during the mercerizing and washing action as the high concentration of caustic removed all of the cohesive forces from the wet cotton. It was also necessary to support the cotton while it was being neutralized. Wet sliver lap having less than 150% residual water would process continuously without a support, ie, pull out of a truck through the squeeze of a padder. The dried mercerized sliver lap was much more compact and had greater cohesiveness than the untreated cotton. The sliver lap was dried satisfactorily by dry cans but the surface of the lap was somewhat packed down. It was necessary to have no piece-ups in the lap as the ends fell out during the processing. If any joints had to be made, overlaps of at least a yard were necessary to insure proper processing in a continuous manner.

The yarns and fabrics to be described later were made from sliver mercerized on the continuous range.

MANUFACTURING ORGANIZATIONS——The more pertinent manufacturing organizations for cotton fiber mercerized without tension in fiber form (treated) and for the untreated cotton are as follows.

The mercerized stock was carded at one-half the production rate of the untreated cotton (eg, doffer speed for treated stock: five rpm; for untreated: 10 rpm).

The drawing manufacturing organization was the same for both treated and untreated, except that eight ends were fed for the treated stock and six ends for the untreated. Close roll settings are recommended for both the treated and the untreated stock. (Front to second: 1-3/16″; second to third: 1⅜″; third to fourth: 1½″).

The back-zone setting in roving was opened for the treated stock (4 vs 3 for the untreated stock) and the front-zone draft was reduced (4.5 vs 6 for the untreated stock). The twist multiplier was increased slightly for the treated stock (1.10 for the treated and 1.05 for the untreated).

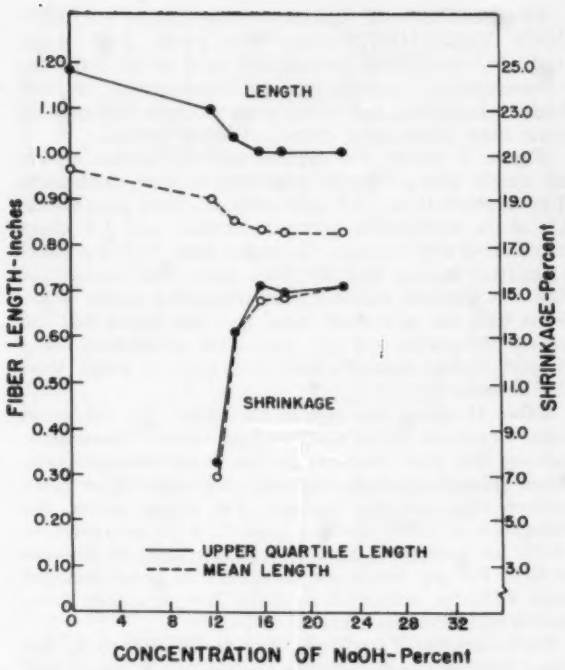

Figure 4
Fiber length and shrinkage as influenced by concentration of mercerizing bath

The roll setting in spinning was opened for the treated stock. The front-zone draft was reduced slightly.

RESIN TREATMENT AND RECEPTIVITY TO DYES——Four different resin treatments were applied commercially to fabrics woven from yarns subjected to various mercerizing treatments. Using standard commercial practices, curing time was maintained constant (70 secs) but percent resin add-on and curing temperature were varied:

Sample	*% Pickup (solids)*	*Curing temperature (°C)*
DR-1	6.0	140
DR-2	6.0	180
DR-3	3.6	140
DR-4	3.6	180

DYEING OF KNITTED AND WOVEN FABRICS——The knitted and woven fabrics used in the dyeing tests were scoured prior to application of direct and vat dyes.

The knit cotton tubings were scoured with 1% anionic detergent and 1% soda ash for one hour at 190°F. All of the tubing was scoured at the same time to insure uniformity of treatment.

The woven fabrics were desized with 1% Rhozyme LA and 0.1% Triton X-100 at 180°F for 30 minutes. These fabrics and yarn skeins were scoured with 2% soap, 2% soda ash, and 1% Calgon for one hour at a boil.

The materials were dyed with two different direct dyes (CI Direct Green 27, 2%, and CI Direct Brown 31, 1.5%), one of which exhausted quickly while the other was very slow in exhausting. The dyes were applied by conventional dyeing procedures using 15% salt as the exhausting agent. The temperature was raised to a boil over a 45-minute period, and the dyeing continued just below a boil for 30 minutes more. After being dyed, the samples were rinsed with cold water to remove excess dye. The materials containing the same type of cotton throughout were dyed each in a separate dye cup in order to compare the maximum dye absorption of each type of cotton. The cotton tubing composed of bands of different cottons was dyed separately to compare the relative dye absorptivities of each type of cotton.

The materials were also dyed with two different vat dyes (CI Vat Blue 18, 3%, and Ponsol Brown AG Double Paste, 3%), one of which exhausted quickly while the other had a slow rate of exhaustion. The dyes were applied by conventional methods. Three ounces per gallon of caustic and hydro were used to reduce and apply the dyestuff. The dyestuff was reduced and applied at 140°F in each case. The fabric and skein samples were entered into the reduced dyebath and dyed for one hour at the proper temperature. After dyeing, the samples were rinsed and then oxidized with sodium perborate and finally given a mild soaping with 0.5% soap and 0.5% soda ash.

RESULTS AND DISCUSSION

EFFECT OF DIFFERENT CONCENTRATIONS OF SODIUM HYDROXIDE ON COTTON FIBER PROPERTIES——Table I shows the results for five properties of the untreated and the five mercerized lots prepared as described earlier. Each of the reported averages for breaking load and elongation is the mean of 300 individual fiber tests. Fibers mercerized at concentrations of 12-percent caustic or above showed significant increase in breaking load and elongation at break over untreated fibers. There appeared to be no real change in these two properties when the concentration of caustic was above 16 percent.

Mercerization resulted, as might be expected, in an increase in denier, no further increase being evident beyond a concentration of 16-percent sodium hydroxide. Although the breaking load was increased, it may be noted that the tenacity of the fiber was decreased by mercerization. On the assumption mercerization without tension resulted in a decrease in crystallinity, and in orientation of the cellulose, it might be expected that the increase in elongation shown in Table I would be accompanied by a decrease in tenacity. From a practical point of view, however, the small decrease in

TABLE I
Effect of concentration of caustic soda on cotton fiber strength, elongation, denier, tenacity, and moisture regain

NaOH Concentration (percent)	*Breaking load (grams)*		*Elongation at break (percent)*				
	Mean	*Standard error of the mean*	*Mean*	*Standard error of the mean*	*Denier*	*Tenacity (g/dn)*	*Moisture regain (percent)*
Untreated	3.44	0.108	7.48	0.195	1.84	1.87	7.0
12	3.88	0.103	9.22	0.220	2.14	1.81	8.4
14	4.26	0.112	11.37	0.255	2.45	1.74	9.6
16	4.23	0.117	12.12	0.316	2.59	1.63	10.2
18	4.39	0.115	12.52	0.324	2.57	1.71	10.3
23	4.40	0.104	12.20	0.278	2.58	1.70	10.5

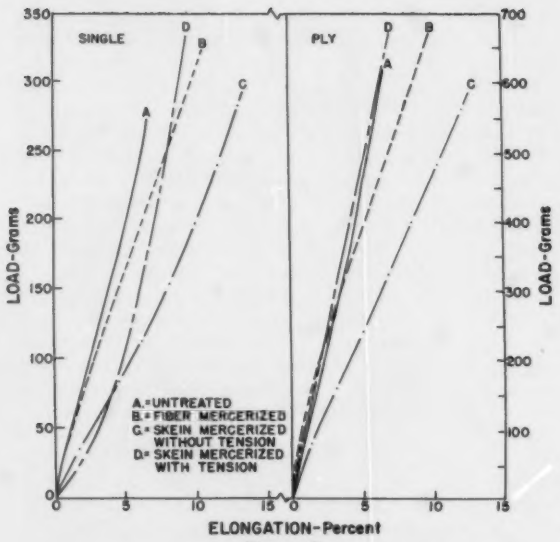

Figure 5
Load-elongation curves of single and ply yarns subjected to various treatments

tenacity is of no importance. The high breaking load of the fiber would indicate that no difficulty, because of excess fiber breakage, would be encountered during mechanical processing.

The other significant properties determined were fiber length from which shrinkage was calculated, shown in Figure 4, and moisture regain shown in Table I. The data may be summarized by stating that the maximum value in every case was reached when the concentration of sodium hydroxide was 16 percent, as in the case of changes in strength and elongation.

In spite of the fact that no further significant changes in fiber properties were observed when concentrations of sodium hydroxide beyond 16 percent were used, this amount of caustic was not employed in subsequent experiments. It was felt that the use of a minimum concentration might not always produce the maximum changes during the mercerization of large lots, and for this reason a concentration of 23 percent for additional experimental work was chosen. Large quantities of mercerized sliver lap were prepared on the continuous range, and the material was then processed into yarns.

PROPERTIES OF YARNS SUBJECTED TO VARIOUS TREATMENTS———The yarns, both single and ply, spun from mercerized card sliver with the recommended manufacturing organization showed higher elongation, and better yarn strength and appearance than those spun from untreated cotton.

Figure 5 shows the typical load-elongation curves for single and ply yarns subjected to four treatments. The treatments are A) untreated, B) fiber mercerized, C) skein mercerized without tension, and D) skein mercerized with tension. It can be seen from the load-elongation curves that the yarn spun from mercerized fiber, in general, shows higher elongation under given loads than the untreated yarn. It is also noted that the yarns, both single and ply, spun from mercerized fibers possess higher strength and elongation at break than the untreated.

Table II shows the results for single and ply yarns from Carolinas cotton subjected to various treatments. Among the four treatments, the count-strength products (skein) of single and ply yarns spun from mercerized fiber are the highest. For single yarns, the elongation at break changes from 6.5% for untreated to 10.7% for yarn spun from mercerized fiber, an increase of 65%. For ply yarns, the elongation at break changes from 6.5% for untreated to 10.0% for yarn spun from mercerized fiber, an increase of 54%.

Yarn variation (yard-for-yard) as determined by the Uster evenness tester was less for the yarns (single and ply) spun from mercerized fiber than for the untreated (single and ply). The yarn appearance is found to be better for the one spun from mercerized fiber than for the untreated.

Tests of significance were made, and it was found that the improvement of strength and elongation at break for the yarn spun from mercerized fiber over the untreated yarn was statistically significant.

The yarns were extended systematically to cover a range of five to 80 percent of the elongation at break. The stress-strain curves obtained before rupture provided the desired information for "immediate recovery," "delayed recovery," and "permanent set", which are the three strain component parts of total elongation.

The elongation components were determined using the Instron Tensile Tester, Model TT-B. The specimen was first extended to the selected extension and the crosshead was then returned to the starting point. After this loading and unloading cycle, the specimen was allowed to relax for five minutes. The specimen was

TABLE II
Properties of single and ply yarns subjected to various treatments

					Skein mercerized			
	ME-2000 untreated		*ME-2106 fiber mercerized*		*ME-2200T without tension*		*ME-2300 with tension*	
Test	*Mean*	*Standard error of the mean*	*Mean*	*Standard error of the mean*	*Mean*	*Standard error of the mean*	*Mean*	*Standard error of the mean*
Single yarns, 26/1, 4.5 TM								
Yarn number	26.1		25.0		25.0		24.8	
Skein break (lb)	73.8		83.4		73.0		81.1	
CXS	1926	17.8	2085	11.4	1825	12.2	2011	19.0
SEB (grams)[1]	267	4.3	328	6.5	291	2.9	333	5.7
CXS (SEB)	6969		8200		7275		8258	
Elong (%)	6.5	.11	10.7	.12	13.2	.20	9.6	.21
TPI	24.0		23.0		24.4		23.9	
Actual TM	4.70		4.60		4.88		4.88	
Yarn variation (%)	124		113		118		101	
Ply yarns, 26/2, 3.0 TM								
Yarn number	26.4/2		26.9/2		26.4/2		25.5/2	
Skein break (lb)	175		199		172		192	
CXS	2310	22.3	2667	14.1	2270	14.6	2458	15.8
SEB (grams)	624	8.9	683	9.7	593	6.9	680	8.3
CXS (SEB)	8237		9186		7798		8670	
Elong (%)	6.5	.06	10.0	.10	12.7	.11	6.9	.09
TPI	10.8		10.2		10.3		10.8	
Actual TM	2.97		2.79		2.84		3.02	
Yarn variation (%)	78		69		65		78	

[1]Single end break

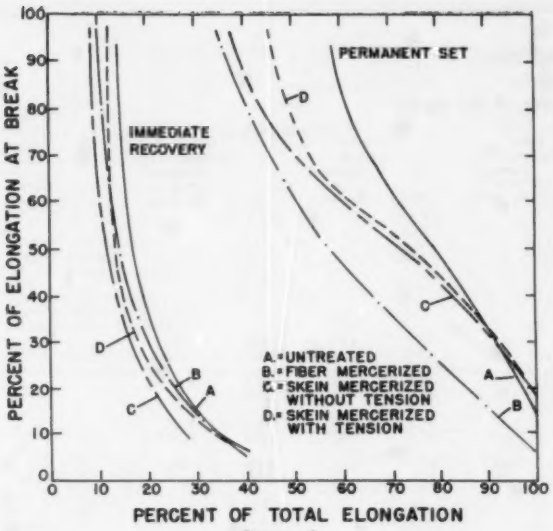

Figure 6
Recovery behavior of single yarns

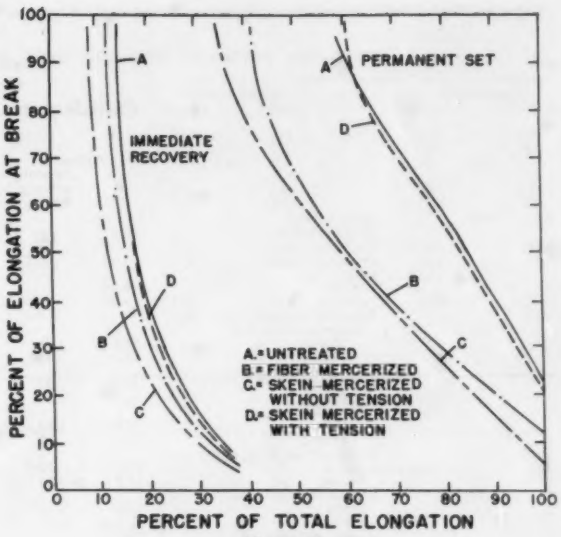

Figure 7
Recovery behavior of ply yarns

then extended again to the same point in a second loading to measure permanent set. The immediate recovery was determined form the first cycle, where an initial straight portion is noticed on the curve, when the crosshead returns. Delayed recovery can be obtained by subtracting immediate recovery and permanent set from total elongation. Immediate recovery, delayed recovery, and permanent set are expressed in terms of percent of total elongation.

Figures 6 and 7 illustrate the recovery behavior of single yarns and ply yarns. In general, the immediate recovery for yarns (single and ply) spun from mercerized fiber is poorer than for the untreated yarns (single and ply). The permanent set is higher for yarn spun from mercerized fiber than for the untreated yarn. The finding is true for both single and ply yarn. Hence, it may be concluded that, although the yarn spun from mercerized fiber possesses higher elongation at break than the untreated, it shows no superiority over the untreated with respect to yarn recovery properties.

It is noted that the immediate recovery between single and plied yarns is essentially alike for the untreated, fiber mercerized, and skein mercerized without tension. For yarn skein mercerized with tension, the ply yarn seems to be better in immediate recovery than the singles. With respect to permanent set, it seems that the single yarn is higher except for that which was skein mercerized without tension.

PROPERTIES OF FABRICS WOVEN AND KNITTED FROM YARNS SUBJECTED TO FOUR FIBER OR YARN TREATMENTS——To evaluate the properties of fabrics made from cotton mercerized without tension, four thirty-yard lengths of fabrics were made from the following yarns:

1) Untreated
2) Fiber mercerized without tension
3) Skein mercerized without tension
4) Skein mercerized with tension

Tables III and IV show the results of physical tests for greige and scoured fabrics woven from yarns subjected to the various treatments.

For greige fabrics, the warp crimp of the untreated and the fiber mercerized yarns is much higher than the yarns skein mercerized with and without tension. The filling crimp of the untreated is the highest among the four treatments.

For greige fabrics in the warp direction, the elongation at break of skein mercerized with or without tension is less than the untreated, while the fiber mercerized treatment produced a fabric which has the highest elongation. In the filling direction, the fabric made from yarn that was skein mercerized without tension, and the one made from fiber mercerized yarns possess higher elongation at break than the untreated material.

Greige fabrics, in both warp and filling direction, showed no significant difference in breaking load for Instron cut-strip tests. For Scott cut-strip tests, yarn skein mercerized without tension had a lower breaking strength than the untreated. For Scott grab tests, the untreated had a higher breaking strength than the fiber mercerized and skein mercerized without tension in both warp and filling directions. However, in the filling direction only, the untreated yarn had a higher breaking strength than the skein mercerized with tension.

For scoured fabrics, the elongation at break for fiber mercerized, skein mercerized with and without tension was higher than the untreated in both warp and filling directions. For Instron cut-strip tests, the untreated had higher breaking strength than the skein mercerized without tension in both warp and filling directions. For Scott cut-strip tests, no significant treatment effect was found in fabric breaking strength in the warp direction; however, the yarn skein mercerized with and without tension produced fabrics of lower breaking load in the filling direction. For Scott grab tests, in the warp direction the untreated appears to have the highest breaking strength.

RECOVERY BEHAVIOR OF GREIGE FABRICS WOVEN FROM YARNS SUBJECTED TO VARIOUS TREATMENTS——The previously described method used for determining recovery behavior of yarn was also used for determining recovery behavior of greige and scoured fabrics woven from yarns subjected to various treatments.

The cotton used in this part of the work was Carolinas 1-1/32-inch Brt M. The Instron tensile testing

TABLE III
Physical properties
Greige fabrics
(including standard error of the mean)

Test	Untreated Mean	Untreated Standard error of the mean	Fiber mercerized Mean	Fiber mercerized Standard error of the mean	Skein mercerized without tension Mean	Skein mercerized without tension Standard error of the mean	Skein mercerized with tension Mean	Skein mercerized with tension Standard error of the mean
Ends x picks	73 x 68		72 x 67		74 x 67		73 x 66	
Width (inches)	28.5		28.5		28.2		28.8	
Oz/linear yard	3.33		3.16		3.17		3.30	
Oz/square yard	4.21		3.99		4.05		4.12	
Crimp (%):								
Warp	9.25		8.62		3.25		4.50	
Filling	9.25		5.00		7.25		7.62	
Breaking strength (lbs):								
Instron (cut strip)								
Warp	54.8	1.46	54.4	.74	51.2	1.03	56.4	.87
Filling	43.9	1.46	43.7	.88	42.9	.54	44.0	.94
Scott (cut strip)								
Warp	58.6	.92	57.6	1.12	52.2	.67	57.8	1.63
Filling	50.0	2.24	49.4	1.86	34.6	.74	45.6	.81
Scott (Grab)								
Warp	77.8	1.12	74.0	1.10	71.2	1.28	75.0	1.14
Filling	72.2	.87	65.5	.74	59.8	.81	62.0	1.79
Elongation at break (%):								
Warp	15.5	.30	19.3	.20	11.2	.21	10.8	.55
Filling	17.2	.40	19.5	.26	23.8	.15	17.9	.34
Tearing strength (lbs):								
Warp	3.6		3.8		3.0		4.5	
Filling	2.2		2.5		3.0		3.7	
Schiefer abrasion (R)	36976		23871		52446		60158	
Log R	4.568		4.378		4.720		4.779	
Thickness (inches at 0.1 psi)	0.015		0.016		0.015		0.015	

TABLE IV
Physical properties
Scoured fabrics
(including standard error of the mean)

Test	Untreated Mean	Untreated Standard error of the mean	Fiber mercerized Mean	Fiber mercerized Standard error of the mean	Skein mercerized without tension Mean	Skein mercerized without tension Standard error of the mean	Skein mercerized with tension Mean	Skein mercerized with tension Standard error of the mean
Ends x picks	76 x 69		77 x 71		77 x 70		76 x 68	
Width (inches)	27.0		26.8		27.1		27.2	
Oz/linear yard	3.10		3.09		3.01		3.27	
Oz/square yard	4.10		4.11		4.01		4.32	
Crimp (%):								
Warp	10.9		8.50		6.50		11.5	
Filling	13.4		15.2		16.6		11.8	
Breaking strength (lbs):								
Instron (cut strip)								
Warp	50.5	1.41	48.6	1.67	44.6	.46	48.2	1.24
Filling	42.8	1.06	38.2	.78	31.5	.98	41.7	1.61
Scott (cut strip)								
Warp	48.1	2.53	50.4	1.24	42.2	2.28	50.7	1.16
Filling	50.9	1.69	47.2	1.63	29.0	1.47	43.4	1.25
Scott (grab)								
Warp	68.9	2.18	60.4	2.24	56.3	1.52	59.1	.80
Filling	56.9	1.67	61.2	1.12	49.3	.72	55.0	1.13
Elongation at break (%):								
Warp	17.4	.27	20.0	.17	18.5	.16	20.1	.27
Filling	22.9	.39	25.7	.31	27.4	.66	25.3	.56
Tearing strength (lbs):								
Warp	3.4		3.1		3.0		4.2	
Filling	3.0		3.6		3.2		4.2	
Schiefer abrasion (R)	81552		69947		48154		65458	
Log R	4.911		4.845		4.682		4.816	
Thickness (inches at 0.1 psi)	0.022		0.019		0.020		0.020	

machine was used for the test; the crosshead speed was 10 inches/minute with 10-inch gauge length. Tests were performed at standard atmospheric conditions.

Figure 8 is a plot of the immediate recovery curve and permanent set for four various greige fabrics. The immediate recovery of greige fabrics woven from untreated yarn was higher than greige fabric woven from yarn made from mercerized fibers up to about 60% of elongation at break, beyond which point the behavior was essentially alike. The greige fabric made from yarn skein mercerized with tension showed the least immediate recovery. The permanent set of greige fabric made from fiber mercerized yarn was less than the untreated up to about 47% of elongation at break; beyond this point the reverse was true.

The immediate recovery and permanent set curves for various scoured fabrics are plotted in Figure 9.

TABLE V
Physical properties of Knit Fabrics

Test	Untreated Mean	Untreated Standard error of the mean	Fiber mercerized Mean	Fiber mercerized Standard error of the mean	Skein mercerized without tension Mean	Skein mercerized without tension Standard error of the mean
GREIGE TUBING						
Wales/inch	34		32		27	
Courses/inch	35		34		40	
Bursting strength (lbs)	60.2	1.5	51.8	1.9	62.1	1.5
Thickness (inches at 0.1 lbs/sq in)	0.037		0.048		0.048	
SCOURED TUBING						
Wales/inch	31		33		29	
Courses/inch	38		37		39	
Bursting strength (lbs)	62.4	2.2	59.6	1.9	53.0	1.3
Thickness (inches at 0.1 lbs/sq in)	0.032		0.034		0.032	

TABLE VI

Test results of resin-treated fabrics woven from yarns subjected to various treatments

Test	Untreated Warp	Untreated Filling	Fiber Mercerized Warp	Fiber Mercerized Filling	Skein mercerized, Without tension Warp	Skein mercerized, Without tension Filling	Skein mercerized, With tension Warp	Skein mercerized, With tension Filling
DR-1								
Crease angle (degrees)	143	144	125	129	144	138	145	140
Tearing strength (lbs)	1.6	1.7	2.4	2.6	1.9	2.1	3.1	3.6
Stoll abrasion[1] (cycles)	247		237		227		202	
DR-2								
Crease angle (degrees)	151	145	136	134	145	145	152	143
Tearing strength (lbs)	1.4	1.7	2.3	2.5	1.7	2.0	3.0	3.1
Stoll abrasion (cycles)	107		111		118		159	
DR-3								
Crease angle (degrees)	145	132	117	120	128	125	127	128
Tearing strength (lbs)	2.4	2.5	3.2	3.3	2.8	2.8	3.8	3.9
Stoll abrasion (cycles)	157		163		231		221	
DR-4								
Crease angle (degrees)	134	134	137	131	117	134	128	132
Tearing strength (lbs)	1.9	2.0	2.7	3.0	1.8	1.9	2.7	2.8
Stoll abrasion (cycles)	133		140		154		174	

[1]Stoll abrasion test for warp and filling.

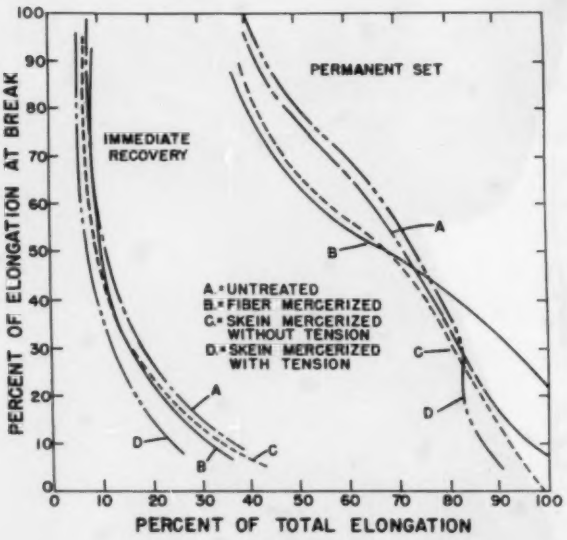

Figure 8
Recovery behavior of greige fabrics

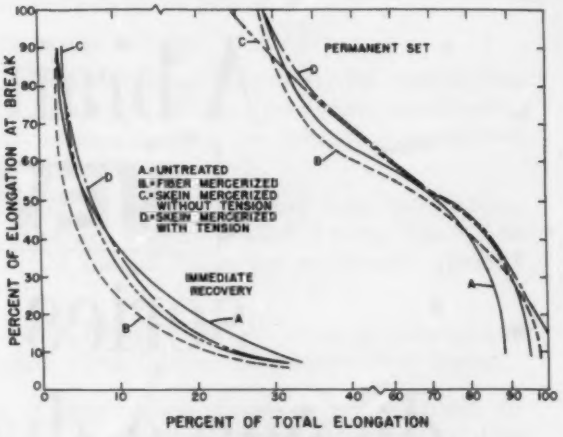

Figure 9
Recovery behavior of scoured fabrics

It is noted that for scoured fabrics, the immediate recovery for untreated fabric was consistently higher than that of the fabric woven from fiber mercerized yarn at all points of percent of elongation at break.

Since the scouring process practically eliminated the size deposition on each of the four fabrics, it may be concluded from the tests of scoured fabrics that in general the recovery property of fabric woven from fiber mercerized yarn is poorer than that for the untreated yarn. The permanent set of scoured fabric made from fiber mercerized yarn was less than the untreated up to about 42% of elongation at break beyond which point they were practically alike.

Table V shows the results of tests for greige and scoured tubing knitted from various yarns. The bursting strength of greige tubing knitted from fiber mercerized yarn was lower than that of tubing knitted from untreated yarn. For scoured tubing the bursting strength was about the same for fabrics knitted from fiber mercerized and untreated yarns, while the skein mercerized without tension showed lower bursting strength than the fabric knitted from untreated yarn.

RESULTS OF RESIN TREATMENT EXPERIMENTS AND DYE RECEPTIVITY——Table VI lists the test results for various fabrics subjected to each of the four different resin treatments. Judged by crease recovery, fabrics made from stock mercerized cotton were inferior to the remaining samples. At an add-on of 6% resin, virtually no difference between the remaining three samples was noted. The mercerized materials, however, had higher tearing strengths than the unmercerized fabric after resin treatment. The tearing strength of the fabric prepared from yarn mercerized under tension appeared to be superior. The results for abrasion resistance showed no general pattern.

With both direct dyes and vat dyes, the color yield was better in every case with the cotton that was skein mercerized without tension. The fiber mercerized material was not quite as receptive to the dyestuff as the material just mentioned, but was superior to the remaining samples.

CONCLUSIONS

Experimental work was undertaken to determine the physical properties and chemical behavior of mercerized cotton fiber produced by tensionless procedures. As a first step, studies were made relative to the most optimum concentration of sodium hydroxide for the tensionless mercerization of cotton fiber and the development of an appropriate method for the mercerization. No further changes in properties were found beyond a concentration of sodium hydroxide of 16%, the effects being determined by changes in length, denier, strength, and elongation. The fiber breaking load and

(*concluded on page 63*)

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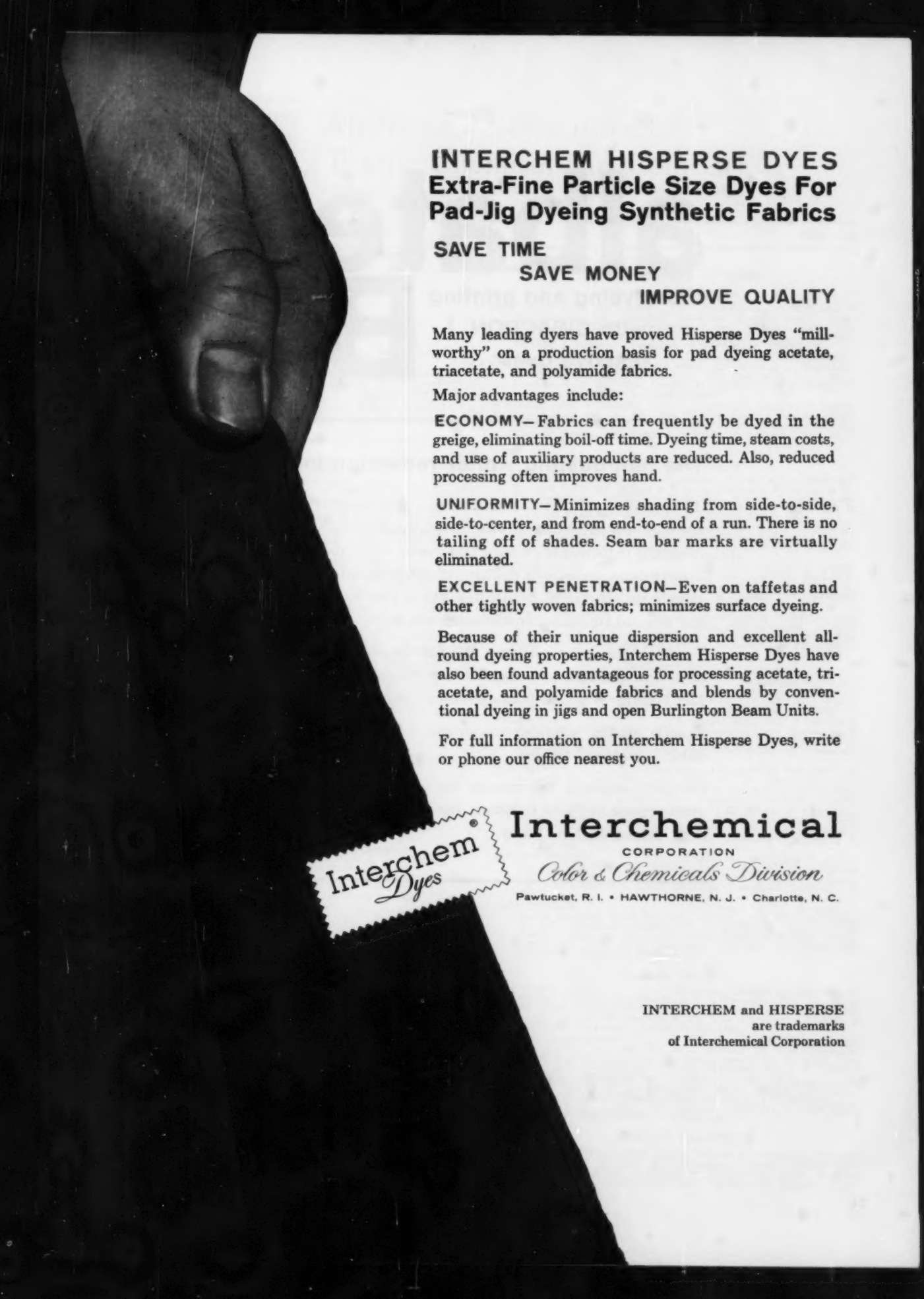

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1961 National Convention———

IMPORTS—AND YOUR JOB*

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The history of United States tariffs shows their effectiveness over the years in assisting the textile and supplying industries. The history of world trade shows the complexity of international problems that now exist. Our present relationships with other countries as involved in the Trade Agreements Act and the General Agreement on Tariffs and Trade (GATT) are discussed.

Tables showing the rapid rise of imports from low-wage countries are presented. Wage comparisons with other countries depict the tremendous handicap under which we must compete.

Current problems, such as unemployment, loss of world markets, loss of domestic markets, gold outflow and defense aspects are considered in the light of the present political situation.

Various solutions to these problems are proposed, the most plausible being the maintenance of adequate tariff protection or the imposition of quotas.

YOU have probably been confused by the various arguments on the subject of tariffs. People are frequently classified as either "free traders" or "protectionists". College economics professors have been teaching free trade for years, arguing that each country should produce that which it can make best and trade it to other countries for those products they can produce best unhampered by restraints such as tariffs and quotas. This is fine in theory but gets quite complicated in a world with widely differing wage rates, standards of living and government regulations. This free-trade theory is supported strongly by many of the Federal Administration. They would subsidize with government funds industries which cannot compete under a further tariff reduction.

At the other extreme are those hard-core protectionists who would protect, with a tariff wall, all American industry no matter how inefficient or of how little strategic importance.

I would like to advocate a policy between these two extremes. This policy recognizes that international trade is not only desirable but necessary. On the other hand, industries essential to the economic and military security of the country should operate under conditions which will assure their health.

In a word I am advocating *Selective Security Tariffs*, a policy proposed by the Synthetic Organic Chemical Manufacturers Association.

Let me give you a little background on how and why we arrived at this point.

In November 1916 the German submarine "Deutschland" slid into New London, Conn. She had for the second time in four months run the British blockade and delivered over 500 tons of coal-tar dyes and medicinals. She was returning with an equal weight of rubber and nickel ingots. Why was this such a significant event?

The Germans had monopolized the dye industry (in spite of its English origin) and had made the United States dependent on them by ruthlessly cutting prices so that no American industry could exist without tariff protection. It was the German hope that our dependence would not only keep us from declaring war on them but that we would assist them in breaking the British blockade.

We all know what happened. The American organic chemical industry emerged. Due to lack of information and the complexity of the business, this was no easy task under the pressures of war. President Wilson, who was in general an exponent of free trade, recognized the importance of a domestic chemical industry for economic as well as defense reasons and urged tariff protection which was passed.

Since the Germans (and the Swiss and the British and many others) with low labor rates can make these products cheaper than we can, should we return to the situation prior to our entry in World War 1?

Let's look at a little more history. On July 4, 1789, the second law passed by Congress was a tariff act. This was designed for two purposes:

1) *For Revenue.* It is interesting to note that customs duties were the main source of revenue until 1910. Now they do no more than pay the costs of collecting them.

2) *For Protection.* The young industries of this country, just getting established, could not compete in many cases with imports from Europe.

Following many additional tariff acts, Congress in 1934 passed the Trade Agreements Act. This was a depression measure designed to encourage trade. It authorized the President to cut duties up to 50%. According to the Constitution, Congress has the authority and responsibility to control foreign trade; but in this Act, authority was passed to the Executive Branch. Successive trade agreements acts authorized further tariff reductions which are now cumulative to more than 75% of the 1934 rates.

TABLE I
Authorized tariff reductions
(percent)
Period just prior to 1934=100

1934	- to 50
1945	- to 25
1955	- to 21.25
1958	- to 17

The average tariff on all goods shipped into this country (including those coming in tariff free) is now about 5%. While comparisons are difficult, due to the various methods of keeping statistics, it appears that of 43 major trading countries only seven have lower average tariffs than the United States. *We are a low-tariff country.* This statement is emphasized since many free-trade proponents imply that we have a high-tariff barrier.

The textile industry is of course a very old one. Since clothing is a basic requirement, as new countries emerge from a backward state, one of the first industries established is textiles. This in itself is good. But since World War II large textile industries have appeared in practically all low-wage countries. Since the United States is a more profitable market than the home market, these countries produce for export. This worldwide overproduction gives the advantage to countries with low labor costs.

Are we to sacrifice our textile in-

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dustry because of this situation? Are we to sacrifice the organic chemical industry, which we have already discussed and which supplies dyes, finishing agents and other textile auxiliaries?

The complexion of world trade has changed materially over the years. In the past, major European countries established colonies abroad from whom they bought raw materials and to whom they sold manufactured goods. The fall of colonialism is apparent to all.

Prior to World War II the United States was more productive than most of the World. Our assembly-line techniques and other efficiencies offset our high wages so that we had no trouble competing with the hand methods used abroad. We still need many products from abroad: products which we cannot grow or mine or in some cases even make efficiently.

PRESENT STATUS

After World War II, it was considered necessary to spend billions of dollars setting our friends and former enemies up in business. Certainly they required help after the devastation of war. We helped them build the most modern of plants, trained their employees and taught them to sell even in the United States. As a result their efficiency approaches that of the United States and their wages are much lower. It is difficult to obtain accurate, comparable figures but those in Table II will give order of magnitude comparisons.

TABLE II
Average wage rates including fringe benefits

	Chemical industry
Japan	.38
Italy	.57
France	.90
Germany	.90
England	.86
USA	2.85

With tax situations which are often more favorable than ours, it is easy to see that we can be undersold not only in world markets but at home as well.

The Trade Agreements Act which operates through the General Agreement on Tariffs and Trade (GATT) calls for reciprocal tariff reductions. These have been found in many cases not to be reciprocal. Since our tariffs are already low we do not get our share from these negotiations. Many people are under the impression that we should eliminate the tariffs we now have in order to get other countries to eliminate their restrictions. Actually in many cases we could not sell abroad since our costs are basically so much higher. This type of negotiation will be of no value to us. Their tariffs are not the bar to our products.

Relief for American industry is supposedly available through the so-called peril point and escape clause procedures. These are investigations by the Tariff Commission. On complaint of any industry, labor group, government agency or individual a study must be made as to whether imports are harming or threatening to harm a domestic industry. If such is found, the Tariff Commission recommends relief procedures to the President, who may accept or reject them. In the case of peril point, a rate of duty is named below which domestic industry would be harmed. In the case of escape clause, in increase of duty is usually recommended. Several US Presidents and many cabinet officers have assured us that domestic industry would not be harmed by the Trade Agreements Act.

Table III shows that these relief measures have not been very effective.

TABLE III
Record of 103 escape clause cases 1948 - 1961

68 cases - Tariff Commission rejects relief
22 cases - President rejects relief
13 cases - President proclaims relief

103

Not only is the percentage poor but during the long periods of time involved a company may be forced out of business.

LOSS OF WORLD MARKETS

In many areas we are unable to compete because of our high prices and consequently we have lost in world markets. While we still export more than we import, these figures must be examined with care.

Export figures are given in terms of US prices, which are high, while import figures are usually given in foreign invoice value, which is low.

Figures collected by the Brookings Institution show that, in the organic chemical field, for every million dollars worth of imports, 75 jobs are lost while for every million dollars worth of exports 16 jobs are involved. This means we must export nearly five times as much as we import to keep the jobs equal. The reason, of course, is that we export high-production, low-labor items with which we can compete and import high-labor items which are cheaper than corresponding items made in this country.

LOSS OF DOMESTIC MARKETS

In the case of domestic markets many losses are apparent, but perhaps some others are not.

55% of our transistors come from Japan.

53% of our tennis rackets and 92% of the badminton rackets are imported.

Baseball is the great American game, but 40% of the gloves are imported.

In 1959, over two million sewing machines were imported, over one million from Japan. There is only one domestic manufacturer left.

On steel flatware, the US price is $2.32 per dozen while the price of Japanese products delivered in the US is $.84 per dozen.

Most of the US consumption of household chinaware is imported.

Bicycles, watches, typewriters, clothespins and cameras have all been hard hit.

In the textile industry, which is of especial interest to this group, we find the following:

TABLE IV
Principal textile manufacturers

	Imports	*Exports*
	Millions of dollars	
1948	103	600
1950	175	350
1955	275	375
1956	350	375
1957	330	380
1958	360	330
1959	500	330
1960	565	340

TABLE V
Cotton yarn imports (thousands of pounds)

1953	200
1955	180
1957	210
1959	1,400
1960	15,000

TABLE VI
Cotton cloth imports (millions of square yards)

1953	60
1955	125
1957	125
1959	240
1960	455

TABLE VII
Man-made-fiber fabric imports (millions of pounds)

1953	0.9
1955	1.4
1957	3.9
1959	10.8
1960	10.1

TABLE VIII
Apparel imports
(millions of dollars)

1953	40
1955	75
1957	125
1959	195

It would have required 97 US factories each employing 250 workers to make the garments imported in 1959.

TABLE IX
Dye imports
(millions of pounds)

1955	3.2
1956	2.8
1957	3.2
1958	3.4
1959	4.3
1960	4.1

Now these millions of pounds of imported dyes were used to a large extent by the textile industry. In many cases they were used by textile mills which are complaining loudly about textile imports. This is not a very consistent position.

GOLD OUTFLOW

Our exports do not balance imports plus foreign aid plus military aid resulting in an outflow of gold. While this has been slowed recently by a change in bookkeeping, the causes are still present.

If continued, the soundness of the dollar is jeopardized. Our domestic inflation, and the fact that productivity is not keeping apace of wage increases, adds to this problem.

DEFENSE ASPECTS

It is obvious that we need strong industries in time of emergency. This can be, only by encouraging industry at all times. The textile industry has submitted figures to show a trend which would put it in a poor position, unable to meet a national emergency. We cannot be put into the position similar to that of the period prior to World War I when we were entirely dependent on foreign sources for our organic chemicals. We must have jobs for technical people at all times in order to have them available when the need is greatest.

Many of our economic troubles stem from an overcapacity to produce. Yet in a time of emergency this capacity and more is required. The security importance of the textile and chemical industries cannot be overemphasized.

INDUSTRIES MOVING ABROAD

Since American industries are barred from many foreign markets by our high wage scale, many companies are building plants abroad. This is the only way they can compete in foreign markets.

NEED FOR WORLD TRADE

Certainly the need for world trade is stronger now than ever before. It must be encouraged not only for its humanitarian but for its political aspects. As the standard of living abroad is improved the problems outlined above will become less severe, but this will take a long time.

Other countries do not hesitate to protect their industries as evidenced by this headline in a recent business paper: "Japan Weighs Duty Rises to Stem Flow of Imports".

SOLUTIONS

1) *Lower our standard of living.* No.

2) *Buy American.* These compaigns do not really work since we all love a bargain.

3) *Get more efficient.* . . Practically all companies are attempting to improve their cost position on a continuing bases. It is difficult to make up in efficiency for a wage differential of four to 10 times.

4) *Subsidize industries.* The Administration appears to be pointing to a tariff reduction era. The present trade agreements act expires in June 1962. Indications are that the President will ask for authority to decrease or eliminate tariffs on an across-the-board basis. Industries harmed by imports would be subsidized by business loans, retraining of employees for other jobs, extended unemployment payments, etc.

This seems like a poor and expensive solution to a problem that could be solved by the maintenance of adequate selective tariffs or quotas. In fact, we need some real objective criteria for determining injury to domestic industry so that relief can be afforded before an industry dies and throws its employees out of work.

5) *Voluntary Quotas.* This is the present scheme being tried by the Administration on the textile industry. It is based on a premise that the government knows more about the business of textiles than does the industry itself. It guarantees little or no future protection to the industry.

All American industry asks is to compete on an equal basis. We are not afraid of fair competition. World trade should prosper on bases other than a tremendous difference in wage scales.

Let us not permit enthusiasm for untried theories to lead us into a position of looking on *all tariffs* as being either good or bad *per se*. Rather let us support trade policies which encourage domestic production of those products which our nation can best produce from the standpoint of its own welfare and national security.

If there is another world war, we will not be granted the two years grace we had in 1914 and 1939. In our opinion selective security tariffs would go a long way to guarantee our readiness.

The Trade Agreements Act expires in June 1962. The administration is already planning a successor act which would be in the direction of free trade. Don't hesitate to let your representatives in Congress know how you feel. It could mean *your job.*

YOUR membership lapel emblems, pins and tie clips are badges of distinction. Do you wear them at section meetings, national conventions, on business and social occasions?

Lapel emblems are available at $2.25 and pins at $2.50. AATCC emblem tie clasps (gold), specially boxed for gift presentation, sell for $4.00 each. All are available through National Headquarters, Box 28, Lowell, Mass.

1961 National Convention———

OPTIMUM DYEING AND FINISHING OF SPECIFIC POLYESTER BLEND FABRICS*

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The results of a comprehensive evaluation, characterization, and classification of over two hundred disperse dyes for polyesters are reviewed in light of the problems which a practical dyer must solve in dyeing fabrics made from basic polyethylene terephthalate polyester fibers such as Fortrel, Terylene and Dacron 54.

A critical selection of dyes was used in developing commercial procedures for the yarn dyeing of Fortrel/cotton to achieve adequate sublimation fastness to heat treatment or resin-curing conditions, and thus allow the use of these yarns in yarn-dyed fabrics containing white pattern areas.

The mechanism of disperse dye staining on wool, as well as the practical application of these principles to minimize this staining when piece dyeing Fortrel/wool fabrics are discussed.

Procedures are described for mechanically finishing Fortrel/wool blends in soft textured fabrics which significantly improve the pilling resistance of these fabrics. Particular emphasis is placed on removing the polyester fibers from the fabric surface by shearing or singeing and then fulling to bring the wool to the fabric surface.

Soft silk type "hands" can be imparted to Fortrel/cotton blend fabrics through a combination of hot calendering or Schreinerizing, caustic treatment, and the use of silicone-type finishes.

INTRODUCTION

THE Celanese Fibers Company began marketing Fortrel polyester fiber during 1960. Fortrel is produced by Fiber Industries, Inc, a company which is jointly owned by the Celanese Corporation of America and Imperial Chemical Industries, Ltd.

To insure that fibers marketed by Celanese go into fabrics which will meet performance standards expected of them by the ultimate consumer, Celanese established a fabric identification program for fabrics containing Arnel triacetate. A similar program is in effect for Fortrel polyester fiber. To assist our customers in processing Fortrel polyester blend fabrics, considerable technical information has been developed in the textile processing and dyeing and finishing areas. This information has permitted the production of fabrics which meet the requirements of the Fortrel fabric quality-control program, and has also made possible new performance levels and special aesthetic effects.

Some of the results of this work, which represents new contributions in the field of dyeing and finishing polyester fabrics, will be discussed in this paper, among which are: 1) Characterization of Disperse Dyes for Fortrel, 2) Yarn Dyeing of Fortrel/Cotton Blends, 3) Wool Staining on Fortrel/Wool Fabrics, 4) Pill Resistant Finishing of Soft Finished Fortrel/Wool Fabrics, 5) Achievement of Silk Type Hands on Fortrel/Cellulosic Fabrics.

CHARACTERIZATION OF DISPERSE DYES FOR FORTREL

Basic to any dyeing and finishing development program is the screening, characterization and selection of dyes which will provide a broad range of shades that will meet the fastness requirements established. The working properties of the dyes, such as dyebath stability, ease of dispersing, leveling, rate of dyeing, intrinsic color value, and cost must also be considered.

Fortrel dyes primarily with disperse dyes and some azoic developed dyes. Over two hundred disperse dyes, from seventeen major dyestuff suppliers, have been evaluated on Fortrel and characterized as to fastness and dyeing properties.

The evaluation procedure for screening the dyes consisted of running 2.0% (owf) dyeings for all colors except blues, where 3.0% (ofw) dyeings were used. For evaluating the lightfastness properties, 0.5% dyeings were employed. The dyeings were run two hours at 203°F with 4.0 g/l of an orthophenylphenol carrier at a pH 5.5-6.0 in a 40:1 liquor ratio. Nonheat-set 100% Fortrel fabric, and swatches of cotton, wool, and heat-set Fortrel fabrics were used in the dyeings. After being dyed, the fabrics were given a scour to remove surface dye and dried at 320°F for five minutes to remove residual carrier.

Lightfastness tests at 20 and 40 hours Fade-ometer exposure were run and sublimation tests were conducted on the Atlas Scorch Tester for ten seconds at 380°F. Washfastness tests were run in The Launder-ometer at 140°F for thirty minutes with 5.0 g/l soap. The International Grey Scale was used in assigning fastness ratings, but the staining which occurred on the wool during dyeing was rated by an arbitrary scale.

This range of dyes contains many with *Colour Index* numbers; however, there are a large number of new dyes which can not be characterized by a *Colour Index* number. In fact, each dye must be evaluated and characterized individually because of variations in impurities, stability of dispersions, and particle size, despite similarities in dye structures. For this reason, it was found expedient to classify the dyes as a guide to selection by the dyer into groupings based on use properties rather than chemical structure. For example, disperse yellow dyes with superior colorfastness properties on Fortrel were placed in grouping Yellow I, brilliant lime yellows were placed in grouping Yellow II, yellows with excellent working properties and good light- and washfastness were placed in grouping Yellow III, economy yellow dyes with good color value and moderate fastness were placed in grouping Yellow IV, and reddish yellows of high lightfastness, but moderate wash- and sublimation fastness were placed in grouping Yellow V. This classification scheme was used for all the colors evaluated.

A most comprehensive listing of selected disperse dyes for Fortrel, classified by use properties and with fastness ratings has been included in

*Presented by Ralph E Lacy at the AATCC National Convention, Statler Hilton Hotel, Buffalo, NY. on September 28, 1961.

TABLE I
Disperse dyes with excellent fastness properties on Fortrel

Dyes	Sublimation	Lightfastness* (40 hrs)	140°F Wash test: Shade change	140°F Wash test: Stain acetate	Staining in dyeing: Cotton	Staining in dyeing: Wool
Polydye Yellow GSF	4-5	4-5	5	5	4-5	slight
Foron Brill Yellow 6GFL UD	4	4-5	5	5	5	slight
Setacyl Red PFBL	4	4	4-5	4-5	4	light
Eastman Polyester Red B	5	3	4-5	4-5	3-4	heavy
Cibacete Blue GFL	5	5	5	5	4	moderate
Latyl Blue BG	4	5	5	5	5	slight

*Lightfastness changes recorded by use of IGS for extent of fading at 20 and 40 hours, not L-3, L-4, etc.
NOTE: These are representative of groups containing other dyes of equivalent properties as classified in Celanese Technical Bulletin No. 21.

Celanese Technical Bulletin No. 21. The data are applicable to other basic polyesters of the polyethylene terephthalate type, such as Terylene and Dacron 54.

Table I contains examples of selected disperse dyes which have excellent balance of colorfastness properties on Fortrel. Dyes with excellent colorfastness tend to be slow dyeing, have lower color value, and do not level well; therefore, these dyes would not normally be used for the heavy shades.

A working knowledge of the dye structures available and their inherent fastness properties will enable the dyer to choose those dyes which best solve his dyeing problems. For example, two types of chemical structures are used for reds, the anthraquinone and the azo. The anthraquinone reds generally have good lightfastness, good stability under pressure and minimum staining on wool; however, their fastness to sublimation is generally low. The azo reds generally have good color value and sublimation fastness, but their lightfastness tends to be poor, especially if carrier is not removed from the fiber. The azo structure is subject to reduction, especially in the presence of cotton; therefore, it is necessary to use an acid pH and a mild oxidant, such as Albatex BD (sodium m-nitrobenzene sulfonate; anionic), where dyeings are run under pressure. The azo reds also tend to stain wool to a greater extent than the anthraquinone reds. The choice of which type of red dye structure to use will depend upon the depth of shade and blending fiber present.

This screening and characterization of disperse dyes has permitted the selection of recommended groups of dyes for use in the following commercial applications:

1) pressure dyeing of Fortrel/cotton yarns,
2) dyes for Fortrel/wool blends,
3) dyes for Fortrel/cotton blends,
4) economical heavy shades with acceptable fastness properties,
5) light shades with maximum colorfastness, and
6) dyes for thermal fixation processes.

Applications 1 and 2 will be discussed in more detail later.

In the dyeing of Fortrel/cotton blends at atmospheric pressure, staining of the cotton by disperse blues is a problem where a particularly brilliant or cross-dye effect is to be achieved. Selection of dyes and an intermediate clearing of the cotton can be used effectively. Selection of dyes for good sublimation fastness is also important since this blend will probably be exposed to resin or silicone curing temperatures of 325°F or higher.

Fortrel can be dyed to heavy shades, such as navies, using selected dye combinations and carrier. Although the orthophenylphenol-type carriers are most commonly used on Fortrel, other carrier preparations based on biphenyl, trichlorbenzene, or methyl salicylate will accelerate the dyeing of Fortrel. When heat-set Fortrel is to be dyed to full shades in long liquor ratios, a minimum of 4.0 g/l of an o-phenylphenol carrier will improve dye exhaustion, shade build up, and minimize staining on the cotton or wool. Table II lists three of the better dye recipes for a navy shade on heat-set Fortrel. All dye recipes listed consider dye economy; however, it should be noted that dyes with low cost tend to have lower sublimation and solvent bleeding fastness. Quality-dyeing practices of using sufficient carrier, time, and temperature and afterscouring to remove surface dye can be used to obtain acceptable fastness properties with selected low-cost dyes.

In the selection of disperse dyes for Fortrel/cotton fabrics to be dyed by a thermal fixation process, the type of dyes for the cotton must be considered. Combinations of disperse dyes with vats, sulfurs, fiber-reactive dyes and pigments are being used commercially. Some light union shades are dyed with vat dyes only for both the Fortrel and cotton.

Disperse dyes for various thermal fixation processes must have the following:

1) highly dispersed particles in the pad bath,
2) no agglomeration in the pad bath on storage,
3) no specking on application,
4) good diffusion and leveling properties at 380° to 425°F, and
5) good vaporization fastness.

The working properties of a few of the disperse dyes evaluated for application to Fortrel by a thermal fixation process are listed in Table III. In the screening of disperse dyes for the thermal fixation process, the staining rating on cotton listed in Table III is that staining of the cotton with disperse dyes which is not easily removed by scouring. In a polyester/cotton blend fabric, the pad liquor is absorbed by both fibers. Migration of the disperse dye from the cotton to the polyester fiber occurs during the thermal fixation process; however, several disperse dyes of a low melting point will actually

TABLE II
Navy shades on heat-set Fortrel

	Dye cost*	Wash 140°F: Light (40 hrs)	Wash 140°F: Shade change	Wash 140°F: Stain acetate	Sublimation	Solvent bleeding	Stain on effects: Cotton	Stain on effects: Wool
I. 7.0% Resoline Blue GRL 0.5% Amacron Orange SF	$24.10	4	4-5	3-4	3-4	none	3	moderate
II. 6.0% Eastman Polyester Blue 3RL 1.5% Latyl Blue LS 0.5% Amacron Orange SF	17.34	4-5	4	4	3	moderate stain	3-4	moderate
III. 4.5% Eastman Polyester Blue 3RL 3.0% Eastman Polyester Blue BLF 0.5% Amacron Orange SF	19.68	5	4-5	4	3	moderate stain	3	moderate

*Dye costs per 100 lbs of Fortrel

TABLE III
Evaluation of disperse dyes for thermal fixation on Fortrel

Dye	Optimum fixation temperature (time 90-seconds) (°F)	Vaporization tendency	Specking	Staining on cotton after scouring
Esterophile Yellow 2RL	400	none	none	slight
Amacron Yellow LS	425	none	in light shades	slight
Latyl Yellow 3G	400	moderate	none	moderate
Polynal Burnt Orange O	400	light	none	slight
Palanil Orange 3R	400	light	none	slight
Esterophile Light Pink RJLL	400	slight	none	light
Eastman Polyester Red B	425	none	in light shades	heavy
Foron Red FL	425	none	none	slight
Eastman Polyester Dark Red FL	400	moderate	none	moderate
Latyl Cerise B	380	severe	in light shades	light
Latyl Violet 2R	425	moderate	none	light
Esterophile Lt Blue BJLL	425	none	none	light
Resoline Blue FBL	425	light	none	heavy
Eastman Polyester Blue GLF	425	none	appreciable	light
Latyl Blue BG	400	none	none	light

TABLE IV
Sublimation of disperse dyes for polyesters

	One minute at 320°F Color transfer onto		One minute at 350°F Color transfer onto		30 seconds at 380°F Color transfer onto	
	White Fortrel	White cotton	White Fortrel	White cotton	White Fortrel	White cotton
2% Esterophile Light Yellow 2RLL	5	5	5	5	5	5
2% Latyl Yellow 3G	2	3-4	1	3	1	3
2% Calcosperse Red 2R	5	5	4-5	5	4-5	5
2% Latyl Cerise B	3	3-4	1	3	1	3
3% Eastman Polyester Blue BLF	4	5	3-4	4	3	4-5
3% Eastman Polyester Blue BGLF	5	5	4-5	5	4-5	5

Atlas Scorch Tester used.

penetrate the cotton. This type of stain will reduce the lightfastness and it may dull the over-all shade, especially if fiber-reactive dyes are used for the cotton. This staining is generally cleared in vatting where vat dyes are used.

Sublimation of a disperse dye is primarily a vaporization of the dye due to its high vapor pressure. Poor sublimation properties are usually associated with disperse dyes of the lower melting point class and those containing hydrophobic groups. Experimental evidence and commercial practice indicate that some dyes which have poor sublimation fastness when evaluated by conventional sublimation tests, where the dyed fabric is in direct contact with an undyed fabric and under some pressure from a heated plate, are quite suitable for application to polyester/cotton fabrics by a thermal fixation process. An example of such a dye is Latyl Yellow 3G. It has been postulated that certain dyes, such as Latyl Yellow 3G, may have a high enough vapor pressure at thermal-fixation temperatures to transfer to adjacent undyed fibers, but not high enough to sublime off and coat equipment and give unlevel shades, such as is the case with Latyl Cerise B.

The use of disperse dyes in paste form has been effective in reducing specking of certain dyes which were critical for specking.

YARN DYEING OF FORTREL/COTTON BLENDS

While a large percentage of the dyes discussed earlier will impart excellent fastness properties to piece-dyed Fortrel fabrics, there are special cases in which dyes of only the highest sublimation fastness are suitable. Yarn-dyed fancy constructions containing white pattern areas require an especially careful selection of dyes to prevent dye sublimation onto undyed areas during heat setting, curing, hot calendering and consumer ironing.

Since no published information could be found, and there is some lack of agreement within the industry regarding practical sublimation requirements, a study of time and temperature effects on the sublimation properties of disperse dyes was made. Various times and temperatures simulating the conditions to which a fabric might be exposed during heat setting, curing, hot calendering, and home ironing were used in this study.

Table IV illustrates that, from among the disperse dyes commonly used for polyesters, it is possible by selection to obtain a range of dyes with exceptionally good sublimation fastness.

In this investigation, eighteen dyes were selected from a range of fifty-five candidates which in prescreening showed promising sublimation properties. The eighteen dyes were applied under pressure to Fortrel/cotton yarn and subsequently given a blank vat-dyeing cycle. These yarns were woven into a fabric with alternating white and dyed bands. The white Fortrel/cotton yarns were scoured under pressure to provide for a fabric with a balanced thermal history.

The fabric in these trials was subjected to 12 different temperatures over a range of 288° to 420°F. Five exposure times were used for each dye evaluated. The Rhodiaceta Thermotester has proved to be an excellent instrument for predicting a dyestuff's behavior over a wide range of thermal conditions and time exposures.

Table V shows the highest temperature and time conditions to which each dye can be exposed without sublimation, as well as the conditions under which sublimation can first be detected.

The actual dyehouse heat-setting conditions for two different heat-setting machines were then selected from the test data obtained. The combined effects of sublimation under heat-setting, resin-curing and hot-calendering conditions were also investigated and are shown in Table VI. There was good correlation between the results obtained from laboratory test procedures and from fabrics processed under plant conditions.

The following general conclusions were drawn from the time and temperature sublimation studies:

1) For short exposures (20 seconds) the selected dyes fall into three groups based upon the maximum temperature they could withstand without showing any sublimation. The majority of the dyes fell into the first group which could withstand temperatures of 400°F or more. The second group (three dyes) withstood 375°F and the third group (three dyes) 355°F.
2) At the longer time exposures encountered in curing (three to five minutes), there is much less difference with respect to the temperature at which sublimation first appears.
3) The data shows that for dyes with high sublimation fastness, short exposure at high temperatures is not as severe as longer exposure at low temperatures.
4) For short exposures to high temperatures, the bleached cotton

TABLE V
Effects of time and temperature on sublimation

No.	Dye	20-Second exposure None* (°F)	20-Second exposure First** (°F)	40-Second exposure None* (°F)	40-Second exposure First** (°F)	60-Second exposure None* (°F)	60-Second exposure First** (°F)	Three-minute exposure None* (°F)	Three-minute exposure First** (°F)	Five-minute exposure None* (°F)	Five-minute exposure First** (°F)
1	3% Cekryl Yellow 2GFL	410	420	340	355	330	340	315	325	315	325
2	3% Resoline Yellow RLD	420	—	355	375	340	355	325	330	325	330
3	3% Amacron Orange SF	355	375	315	325	315	325	295	300	—	290
4	3% Eastman Polyester Red B	420	—	355	375	355	375	330	340	325	330
5	3% Eastman Polyester Red 2G	420	—	355	375	355	375	330	340	325	330
6	3% Eastman Polyester Yellow 5GLS	355	375	325	330	295	300	295	300	290	295
7	3% Esterophile Yellow 2RL	420	—	355	375	340	355	330	340	330	340
8	3% Esterophile Yellow 3RLL	420	—	355	375	375	390	330	340	330	340
9	3% Esterophile Orange 3RLL	420	—	355	375	340	355	330	340	325	330
10	3% Esterophile Red RBL	420	—	355	375	340	355	330	340	325	330
11	3% Esterophile Blue BJLL	420	—	355	375	340	355	325	330	315	325
12	3% Esterophile Blue RLL	390	410	355	375	340	355	325	330	325	330
13	3% Eastman Polyester Yellow 8GGLF	355	375	330	340	315	325	300	310	300	310
14	3% Eastman Polyester Yellow W	375	390	340	355	330	340	310	315	310	315
15	3% Latyl Blue BG	375	390	340	355	325	330	300	310	300	310
16	3% Celliton Fast Blue LAFR	420	—	420	—	375	390	340	355	330	340
17	3% Eastman Blue BGLF	420	—	420	—	340	355	340	355	330	340
18	6% Genacron Developed Black FC +1% Esterophile Yellow 2RL	375	390	355	375	340	355	330	340	325	330

*Highest temperature at which there is no sublimation
**Temperature at which sublimation is first detected

Conditions under which cotton shows first scorching		
20-sec	exposure	390°F
40-sec	"	355°F
60-sec	"	355°F
3-min	"	355°F
5-min	"	340°F

Tests were made on the Rhodiaceta Thermotester and all evaluations were based on transfer of dye onto white Fortrel/cotton.

TABLE VI
Evaluation of finished fabrics

Dye	Fabric temperature in heat setting on the frame 15-second exposure* (°F)	Shade change	Discoloration of white**	Fabric temperature in heat setting on Morrison cans 20-second exposure* (°F)	Shade change	Discoloration of white**
Eastman Polyester Blue BGLF	405	4-5	4-5	390	4-5	4-5
Celliton Fast Blue LAFR	405	4-5	4-5	390	4-5	4-5
Esterophile Light Blue RLL	405	3-4	4-5	390	3-4	4
Esterophile Light Blue BJLL	405	4-5	4-5	390	4-5	4-5
Esterophile Red RBL	405	5	4-5	390	5	4-5
Eastman Polyester Red 2G	405	5	4-5	390	5	4-5
Eastman Polyester Red B	405	5	4-5	390	5	4-5
Esterophile Orange 3RLL	405	4-5	4-5	390	4-5	4-5
Esterophile Light Yellow 3RLL	405	4-5	4-5	390	4-5	4-5
Esterophile Light Yellow 2RL	405	4-5	4-5	390	4-5	4-5
Resoline Yellow RLD	405	4-5	4-5	390	4-5	4-5
Cekryl Yellow 2GFL	405	4	4-5	390	4	4-5
Genacron Developed Black FC) Esterophile Light Yellow 2RL) Latyl Blue BG	390	3-4	3-4	375	3-4	4
Eastman Polyester Yellow W	390	4-5	4-5	375	4	4-5
Eastman Polyester Yellow 8GGLF	375	4-5	4-5	360	4	4
Eastman Polyester Yellow 5GLS	375	4	4-5	360	3-4	4
Amacron Orange SF	375	3	3	360	3	3

*After being heat set, the fabrics were resin finished, cured at 320°F for three minutes, and hot calendered at 280°F prior to rating.
**A rating of 4-5 on the discoloration of white can be expected from the resin alone and/or from the cotton scorching. A rating of 3-4 is considered to be commercially acceptable.

scorched slightly before the majority of the dyes showed any tendency to sublime. In order to distinguish between scorching and sublimation, time and temperature tests were made to determine the points at which bleached cotton discolored (see Table V).

The recommended process offers practical procedures which will yield commercially satisfactory fabrics. This process uses the following conditions which are the most favorable for obtaining the highest colorfastness and performance characteristics inherent in Fortrel:

1) *Yarn Pressure Scouring.* Pressure scouring at 265° to 275°F should be used if the yarn is to be finished a bleached white. Scouring at atmospheric pressure is practiced if the yarn is to be dyed under pressure.
2) *Yarn Bleaching.* This step, carried out at atmospheric pressure, eliminates J-box bleaching of fabrics. There are very few disperse dyes in heavier shades which can withstand J-box bleaching without bleeding onto white yarns.
3) *Use of Disperse Dyes with High Sublimation Fastness.* These dyes not only have the sublimation fastness necessary to the process, but also have inherently excellent wetfastness.
4) *Yarn Pressure Dyeing.* This eliminates the need for carriers which have adverse effect on lightfastness, provides maximum dye penetration, improves color value and wetfastness, stabilizes the yarn, and provides other benefits normally obtained through heat setting. A wet pressure treatment at 265°F is equivalent to a dry heat treatment at 390°F. It should be noted, however, that any stresses imposed on the yarns during sizing and weaving will require fabric heat treatment for relaxation in certain constructions.
5) *Vat or Sulfur Dyeing of Cotton.* In addition to providing the best

colorfastness on cotton, the alkaline reduction step in these two dyeing methods provides an effective method for clearing surface disperse dye from the Fortrel and cotton thus further improving the wet and lightfastness.

6) *Use of Fiber-reactive or Naphthol Dyes for Cotton.* These dyes are used for special hot, bright shades.

Table VII outlines a typical procedure for yarn dyeing a 65/35 Fortrel/cotton yarn.

TABLE VII

Typical yarn-dyeing procedure for a 65/35 Fortrel/cotton yarn

Shade: Union Blue

1) Wind a 20-ounce package on a 1⅝" stainless-steel dye tube to a Shore hardness of 10-12.
2) Scour 30 minutes at 205°F with 0.5 g/l Tanapon X-70 (modified polyglycol ether) and 0.25 g/l TSPP. Rinse.
3) Set the dyebath at 150°F with 4.0 g/l Emulphor ON-870 (polyoxyethylated fatty alcohol) and 2% of acetic acid (56%). Circulate 10 minutes.
4) Paste 3.0% Esterophile Light Blue BJLL with warm water and filter into dyebath.
5) Raise temperature to 230°F at 3° per minute. Raise temperature from 230°F to 275°F at 1° per minute. Run one hour at 275°F. Rinse.
6) Dye the cotton in a new bath, set at 100°F with 4.0 cc/l Cassopar GL leveling agent, and 5% CI Vat Blue 14. Run for 10 minutes.
7) Add 7.0% caustic soda flake, which has been dissolved and cooled, and 7.0% sodium hydrosulfite (owg). Run 10 minutes at 100°F.
8) Raise temperature to 150°F at 2° per minute. Run 45 to 60 minutes at 150°F.
9) Drop bath and rinse cold until free of caustic soda.
10) Add 1% sodium perborate and raise to 120°F. Run 10 minutes at 120°F. Drop bath.
11) In a new bath, scour with 0.5% Igepon T and 1.0% soda ash. Raise temperature to 180°F and run 20 minutes.
12) Drop bath. Rinse hot at 180°F for 10 minutes. Rinse cold.
13) Extract and dry.

Note: a) All percentages are based on the weight of the fiber.
b) A reverse flow cycle, three minutes outside-in and two minutes inside-out was used.

The question of whether fabric heat setting is required after the Fortrel/cotton yarn has been processed as previously described was investigated on stripe and check fabric constructions. Physical tests on finished fabrics were made from which the following can be concluded:

1) Pressure treatment of the yarn at 250°F to 265°F renders the Fortrel component of the woven fabric dimensionally stable to repeated launderings.
2) Fabric constructions with warp or filling stripes showed a slight tendency to pucker if not heat set in fabric form. The puckering is probably due to strains developed during sizing and weaving. The check construction did not pucker.
3) In lightweight constructions, fabric heat setting improved pilling slightly over the fabrics which received only the pressure treatment.
4) "Wash-and-wear" and CSI wrinkle ratings are not improved by additional fabric heat setting.
5) The decision of whether or not to heat set in fabric form will depend on fabric construction.

Employment Register

This column is open for two insertions per year, per member, without charge. Blanks may be obtained from, and filed with, the secretary of the Association, Post Office Box 28, Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the secretary.

61-21

Education: Experience

Executive—managerial ability in area of R&D in textiles. Broad background in fabrication, dyeing, finishing and quality control. Strong in natural fibers plus good experience in synthetic field. Resume available.
Location: Will relocate
Age: 50, married

61-22

Education: MS, textile chemistry
Position desired: research or technical service
Location: Anywhere
Age: 24, single, references

61-23

Education: MS, textile chemistry
Position desired: Textile research chemist
Location: Anywhere
Age: 25, single, references

61-24

Education: High school
Position desired: Supt dyeing or technical sales
Location: Northeast
Age: 41, married, references

61-25

Education: BS, textile chemistry
Position desired: Application, development, production
Age: 35, married, references

61-26

Education: BA degree plus special courses in advanced textile design
Position desired: In charge of quality control, textile technological work, in charge of dyeing and finishing, fiber evaluation work
Location: No particular preference
Age: 55, married, references on request

61-27

Education: Bradford Durfee College of Technology
Position desired: Technical sales, chemicals for textile industry
Location: Eastern United States
Age: 42, married, references

61-28

Education: Univ of Mexico, BS, chemistry
Position desired: Tech director for dyeing and finishing plant; chemical engineer or consultant for chemical industry
Location: Anywhere
Age: 43, married, references

61-29

Education: BS, chemistry plus one year graduate study in chemistry
Location: Northeast
Position desired: Manager product development (sales development)
Age: 42, married, references on request

ECR PROPOSALS REGARDING AATCC RESEARCH APPROVED BY COUNCIL

AT its 225th meeting, held November 17 at the Hotel Sherman, Chicago, Ill, the Council formally approved the recommendations of the Executive Committee on Research as presented by Charles A Sylvester, chairman, at the 224th meeting on September 27 at Buffalo, NY.

The Appropriations Committee has investigated the costs of the proposal and made known that funds are presently available to meet it.

ECR has been engaged for over a year in an exhaustive study to determine what the scientific and technical aims of the Association were and how these aims could be best accomplished. Further emphasis was added when ECR was formally asked by the Executive Committee to make such a study. ECR was assisted in the investigation by the results of an AATCC membership analysis, based on occupational classification.

A questionnaire also was utilized in sampling the membership for ideas as to the lines of activity to be followed by AATCC research efforts.

It is believed by ECR that the primary and most important research aims of the Association should be to continue in the (ever-enlarging) field in which it already excels and enjoys a unique position of authority —that of developing test methods. The entire textile industry looks to AATCC for up-to-date, standard test methods which are of vital importance to the industry. AATCC has a dynamic and growing research program in this area, represented by 63 committees with active members drawn from 150 companies. AATCC has approved publication of its 100th test method, which is supporting proof of AATCC's prime area of interest. It is imperative that, while the program already is in high gear, it be safeguarded and implemented. This, as recommended by ECR, could be done by engaging a full-time, competent technical director and a textile chemist.

Research committee chairmen have strongly indicated the need for an effective and expanded technical coordinating force at National Headquarters. The retirement of the research director and the loss of several members of the laboratory staff has left a void that should be filled and strengthened. AATCC volunteer workers would continue to be the life-blood of the research committees. Their time and efforts represent the contribution of hundreds of thousands of dollars to the Association. However, there is a definite need for more centralized control and coordination of the numerous research programs.

EXECUTIVE COMMITTEE ON RESEARCH

C A SYLVESTER, chairman
G S WHAM, vice chairman
G J MANDIKOS, secretary
F FORTESS
P J FYNN
W G HELMUS
A I HULTBERG
H E MILLSON
J D MOSHEIM
R H PHILLIPS

ECR recommended that a technical director be engaged. His duties would be:

1) Direct the technical and research activities of the Association.
2) Coordinate and supervise research committee projects.
3) Assist in the planning and organization of seminars, symposiums and study groups at either the national or sectional levels.
4) Maintain closer liaison with corporate members and study areas where AATCC research can be of value to the industry.
5) Give active support to the Technical Committee on Research and ECR.
6) Coordinate and expand AATCC activities with other technical associations, such as Society of Automotive Engineers, TAPPI, ISO, Federal Government, and others organizations where a common interest exists.
7) Work with chairmen of the Sectional Research Committees on the analysis and formulation of cooperative research projects.
8) Edit test methods in preparation for publication in the *Technical Manual*.
9) Direct the operation of the headquarters technical laboratory.

In addition to a technical director and textile chemist, ECR recommended the maintenance of laboratory facilities to service the technical committees. It was also recommended that these facilities be used for periodic checking of test methods and standardization of new equipment and test aids. Such a laboratory would make an excellent workshop for Headquarters' personnel to demonstrate the authentic methodology of AATCC tests. These facilities would be available to members of the Association.

The textile chemist recommended by ECR would perform liaison duties with research committees in addition to laboratory work.

In conclusion, the ECR strongly recommended that the technical staff, through the technical director, report administratively to the executive secretary and functionally to the Executive Committee on Research.

G S Wham, chairman of the Technical Committee on Research, has stated that he believes the organization of a strong technical staff, with adequate laboratory facilities, is essential to the continued progress of AATCC. Such a laboratory would serve as a test standardization center where any member of AATCC could be instructed in the proper procedure for conducting any of the 100 test methods developed by the Association. Moreover, it would be most useful in assisting the research committees in the evaluation of the various steps involved in the development of tests, and would aid in the refinement of techniques and in the validating of test methodology. The need for the refinement of certain test methods and the development of accelerated tests which require the exposure of fabrics to the various deteriorating agencies in unison, rather than individually, is recognized by many research committee chairmen of TCR as an urgent necessity. The technical laboratory of AATCC could ably explore and lay the preliminary groundwork for such accelerated test development, and serve TCR as an exploratory arm, investigating the various areas of the dyeing and finishing industry where new test methods should be developed. Dr Wham emphasized that the establishment of strong technical facilities was urgent and he urged the Council action to make these proposals realities.

F Fortess, vice chairman of the Technical Committee on Research, stated that, since ECR had received

a directive to implement the report of the Study Committee on Long-Range Objectives, it had discussed broad aspects of the Association's objectives and functions. The recommendation presented by ECR was one of several problems under consideration. In addition, the following projects are being considered for organization and direction by the national organization.

1) Educational services to the membership both at the national and sectional levels should aim to increased involvement of academic facilities and staff in the formation of seminars, workshops and summer sessions under the direction of the national office. The program should be formulated for publication of pamphlets aimed at providing dyers and finishers, particularly, better "How-to-do-it", compilation of facts about fibers, dyes and chemicals, elementary chemistry of textiles, questions and answers, etc. The Association should support an accelerated program of publication of monographs, after discussions with textile colleges, manufacturing representatives, etc, to determine which areas of chemistry applied to textiles require supplementary literature. Lecture tours of experts and scientists should be organized on a broad range of subjects throughout the Sections, particularly reaching the isolated areas. The national office would organize these tours, solicit specific dates and schedule the movement of specific men on selected subjects in a planned manner.

2) Greater support should be provided for sectional research programs in the Sections. The national organization should search out problem areas throughout the textile industry and make a list of these problems available to the research committee chairmen in the Sections. The national organization should also be a clearing house for project topics so that duplication is avoided. The technical director should be available to the Sections to assist in the analysis of projects.

T J Gillick, chairman of the Annual Intersectional Technical Paper Competition Committee, stated that he was very much interested in the ECR report. In January, the Council had accepted the report of the Study Committee of the Intersectional Contest, of which he was chairman. The Study Committee had been of the opinion that the new rules of the competition would provide an opportunity for more Sections to participate and further that the Executive Committee on Research would provide a list of subject matters which require research activity. This list would be available to the Sections. The Study Committee's report stated that the Executive Committee on Research be encouraged to consider the technical paper competition as a means for supplementing its activities, particularly in the task force and test method areas. Mr Sylvester has stated that steps already have been taken by ECR in this direction.

Membership Applications

October 26-November 8, 1961

NEW ENGLAND REGION

Rhode Island Section

Senior

Derek W Oakes—Asst to sales mgr, Arnold, Hoffman & Co, Inc, Providence, RI. Sponsors: C A Robinson, D J Eccleston.

Junior

Donald F Halpern—Research chemist (textile finishes), Warwick Chemical Division of Sun Chem Corp, Wood River Jct, RI. Sponsors: M A Silvestri, G E Sprenger.

CENTRAL ATLANTIC REGION

Delaware Valley Section

Senior

Herbert Phillips—Mgr, laundry engrg labs, Philco Corp, Philadelphia, Pa. Sponsors: G P Paine, G J Mandikos.

Metropolitan Section

Transfer to Senior

David Rogoff—Asst dir, AMC Bureau of Standards, Associated Merchandising Corp, New York, NY. Sponsors: L J Villa, W Anderson.

Niagara Frontier Section

Senior

Leon S Zielinski—Research chemist, National Aniline Div, Allied Chem Corp, Buffalo, NY. Sponsors: W H Leyking, F Sievenpiper.

SOUTHERN REGION

Northern Piedmont Section

Junior

Raymond W Smith Jr—Research chemist, Hercules Powder Co Inc, Covington, Va. Sponsors: C E Coleman, W C Walter Jr.

Piedmont Section

Senior

Elmer H Childress—Head dyer, Meyer Mills Inc, Lincolnton, NC. Sponsors: J B Foster Jr, R L Bridgman.

Robert F Rodman—Dept head, corduroy processing, wet & dry finishing, Velcord Southern Corp, Lumberton, NC. Sponsors: R A Hudak, E D Wielicka.

WESTERN REGION

Mid-West Section

Senior

Kenneth H Schlifske—Technical sales, Sandoz, Inc, New York, NY. Sponsors: H Gendreau, A A Barker.

Harold G Spiegel—President, Thor Chemical Co Inc, Addison, Ill. Sponsors: E H Roedel, B Fay.

AT LARGE

Associate

Norman Wong—Merchant, Norman Wong & Co, 319 Hennessy Rd, Hong Kong.

Elected to Membership

No designation after name indicates Senior
(A) indicates Associate
(J) indicates Junior
(S) indicates Student
*indicates transfer from another class of membership

November 2, 1961

NEW ENGLAND REGION

Western New England Section

Paul C Pascuzzo

CENTRAL ATLANTIC REGION

Metropolitan Section

Luigi B Masero
Albert W Sinclair
*Peter M Crosby**
*Donald W Denman**

Hudson-Mohawk Section

*Donald E Branchaud**

Delaware Valley Section

Carl S Oldach
*Richard C Freeman**

SOUTHERN REGION

Washington Section

Edwin P Bayha (J)

Piedmont Section

Claude M Sigmon
R McCoy Young
Dale P Wright (A)
Perry T Phillips (J)

Northern Piedmont Section

Thomas J Pierce Jr (J)
Arthur P Surrett (J)

Palmetto Section
Leonidas M Calhoun
George M Haynes
Richard F Daniels (J)

South Central Section
Everett W Roark
*Charles W Braswell**
*Gene J W Cote**

Southeastern Section
Gilbert J Darcy

WESTERN REGION

Mid-West Section
Grant C Beutner
Harold W Edwards

STUDENT CHAPTER

Lowell Technological Institute
Bhupendra K Verma (S)

AT LARGE
Kiyonobu Ninomiya
Guillermo L Sy (A)

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November 16, 1961

NEW ENGLAND REGION

Rhode Island Section
Robert F McIntyre (A)
*William J Perron**

CENTRAL ATLANTIC REGION

Delaware Valley Section
*Herbert R Dunkelberger**
*Ivan H Gordon**
*Martha C Moss**
*Andrew Pintozzi Jr**

Metropolitan Section
Ceasar A DeMarco
Albert C Given
Thomas J O'Hara (A)
*Harry N Tobler**
*Francis Raudelunas**
*August Van der Woude Jr**

SOUTHERN REGION

Northern Piedmont Section
William M Craven
James T Dick
Truette W Garrison
Clarence L Hackler

Palmetto Section
Charles J Fitch
Archie M Mathis Jr
Rhita B Wrightson
Robert L Baker (J)
*Walter L Bogan**
*Bobby R Clement**
*Alan D Grover**
*E Randall Poole**
*Charles H Patrick Jr**

Piedmont Section
David J Fillippeli
Thomas M Garland
*Thomas A Brophy**

South Central Section
Harry A Schram
Betty M Ellis (A)
Don Alexander (J)
Daniel K Barlowe (J)
Stanley H Butler (J)
*Eddie M Barringer**
*James A Burkart**
*Ronald J Fryer**
*David L White**

Southeastern Section
Melbourne P Binns
Gordon D Cook
William R O'Dell
Howard M Brittain (J)
*Austin H Whitlock**

Washington Section
Johanna Ross
George A Simon (A)

WESTERN REGION

Mid-West Section
William J Kinnavy
Richard F Spain

STUDENT CHAPTERS

Bradford Durfee College of Technology
Richard H Pierce (S)

Clemson College
Spencer B Bates (S)
Fred B Brackett (S)
Barry A Cox (S)
Robert W Ellis (S)
Richard A Hiles (S)
Larry G Howard (S)
Leonard L Solesbee (S)
Marshall White Jr (S)

Lowell Technological Institute
Deepak V Bhimani (S)
Anil S Merchant (S)
Necat R Tezcan (S)

New Bedford Institute of Technology
John D McKay (S)

AT LARGE
Alain Audet (S)

AATCC Calendar

COUNCIL; NATIONAL COMMITTEES
Jan 24-26 (Hotel Commodore, New York, NY); Jan 24-25 (administrative and research committees, ECR, TCR, Executive Committee); Jan 26 (Council—10 am)
Apr 12-13 (Francis Marion Hotel, Charleston, SC); Council, administrative and research committees

NATIONAL CONVENTIONS
Nov 14-17, 1962 (Atlanta Biltmore Hotel, Atlanta, Ga); Oct 30-Nov 2, 1963 (Boston, Mass); Sept 24-26, 1964 (Hotel Statler, New York, NY); Oct 14-16, 1965 (Conrad Hilton Hotel, Chicago, Ill); 1966 (Philadelphia, Pa)

DELAWARE VALLEY SECTION
Dec 1 (Beck's Restaurant, Philadelphia, Pa)

HUDSON-MOHAWK SECTION
Jan 12 (Amsterdam—Monforts Reactor and the Jet Dyeing Machine); Mar 9 (Amsterdam—Water Repellents, 3M); May 25 (Albany—Historical Aspects of Dyeing); June 22 (Amsterdam—Annual Outing)

METROPOLITAN SECTION
Jan 19 (New York, NY—"Costs", D M Lewis, Colonial Piece Dye Works); Feb 16 (New York, NY); April 13 (Ladies Night—Margaret Ingersol, *Vogue*); May 18 (Kohler's Swiss Chalet, Rochelle Park, NJ—"Nonwovens—Dyeing and Finishing", panel); June (Outing)

NORTHERN NEW ENGLAND SECTION
Dec 1 (Motel 128, Dedham, Mass); Jan 19 (Woodlawn Country Club, Newton, Mass)

NORTHERN PIEDMONT SECTION
Jan 12 (Starmount Forest Country Club, Greensboro, NC)

PALMETTO SECTION
Jan 20-21 (Poinsett Hotel, Greenville, SC); April 14-15, 1962 (Francis Marion Hotel, Charleston, SC)

PIEDMONT SECTION
Jan 27 (Hotel Charlotte, Charlotte, NC); Apr 7 (Hotel Barringer, Charlotte, NC); June 8-9 (1962 Outing—Mayview Manor, Blowing Rock, NC); Sept 29, 1962 (Hotel Barringer, Charlotte, NC)

RHODE ISLAND SECTION
Dec 1 (Annual Business Meeting)

WASHINGTON SECTION
Dec 8 (Harris Research Labs, Washington, DC—S J Kennedy, QM R&E Section, speaker)

WESTERN NEW ENGLAND SECTION
Dec 1 (Shelton, Conn)

CHANGE IN '64 CONVENTION DATES

IN order to avoid a conflict with the National Cotton Council, the Metropolitan Section has changed the date of the 1964 National AATCC Convention. The old date was October 1-3. The new date will be September 24, 25 and 26, 1964.

TEARSHEETS AVAILABLE

Tear sheets of articles which have appeared in AMERICAN DYESTUFF REPORTER since July, 1956 are available in limited quantities. (Consult yearly indexes for list of titles). These may be obtained by sending a stamped, self-addressed envelope along with a request for specific articles. Write TEAR SHEETS, American Dyesutff Reporter, 44 East 23rd St, New York 10, NY.

Activities of the Local Sections

Northern New England

(Submitted by L E Rossiter, publicity chairman, November 7, 1961)

A group of some eighty members and guests of the Northern New England Section met in the Command auditorium at the Quartermaster Research and Engineering Command, Natick, Mass, on October 20 to listen to Stephen J Kennedy, research director for the Textile, Clothing and Footwear Division, QM R & E Command, Natick, Mass, and Lyman Fourt of the Harris Research Laboratories, Washington, DC. The speakers shared a common subject, "Fabric Finishing Requirements in the Biophysics of Clothing Systems".

Dr Kennedy opened his talk with a brief history of clothing and the importance of it in various military applications. The value of the spacing areas between layers of clothing systems as well as the fabric finish and structure were discussed in relation to their transfer of heat and moisture from the body. Dr Fourt continued the discussion by describing a mechanical arm which is used to simulate the body in the measurements of the effect of perspiration and comfort in various atmosphere conditions. His comments were augmented by a series of slides.

The next meeting of the Northern New England Section is scheduled for December 1 at Motel 128 in Dedham, Mass, and will start at 6:00 pm. Henry E Millson of American Cyanamid Co is the scheduled speaker and he will disclose some new observations in the process of dyeing resulting from the use of the microdyeoscope and time lapse motion pictures. He will comment on such matters as the effect of carriers with new synthetics and the cause of bronzing. Dr Millson is expected to divulge a new discovery relating to the use of nonionics in connection with dyeing.

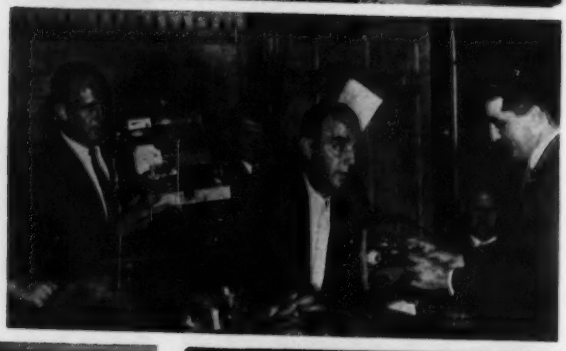
L to r: Stephen J Kennedy, speaker; W George Parks, AATCC vice president, New England Region; Frank J Rizzo, vice chairman; Edward J McNamara Jr, chairman; Robert D Robinson, councilor; Lyman Fourt, speaker

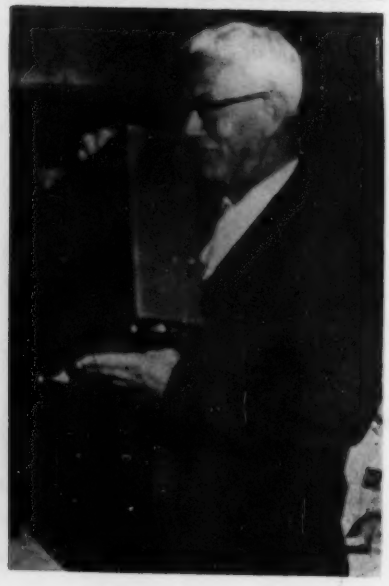
L to r: Stephen J Kennedy, speaker; Frank J Rizzo, vice chairman; Lyman Fourt, speaker; Robert D Robinson, councilor; Joseph S Panto, secretary

Speakers Stephen J Kennedy (left) and Lyman Fourt

L to r: Stephen J Kennedy, speaker; Harold C Chapin, Honorary Member, AATCC; Lyman Fourt, speaker; Edward J McNamara Jr, chairman

PHOTOS TAKEN AT 1961 RHODE ISLAND SECTION OUTING





NOTICE TO AUTHORS OF PAPERS

MANUSCRIPTS for the *Proceedings* of the American Association of Textile Chemists and Colorists shall conform to the requirements and standards given in this *Notice*. Before publication, manuscripts for the *Proceedings* shall be approved by the Editor, not only for editorial correctness according to the standards of this *Notice*, but also for content of technical matter. In his work, the Editor may enlist the aid of anonymous reviewers who are selected for expert knowledge in particular fields.

It is presumed that authors in studying the comments of reviewers and of the Editor will remember that all recommendations are made in a kindly, helpful, sympathetic manner to improve the paper in both literary and technical excellence. Although authors should cheerfully consider suggestions, they are expected to defend their position if justified, especially when strictly technical matters are involved with which the authors have an intimate knowledge.

AATCC strives to maintain a high scientific and professional standard for papers. Authors must make every effort to avoid the use of trade names, commercial products or process names wherever such use may be construed as advertising. Wherever possible, scientific nomenclature must be employed eg, *Colour Index* designations for dyestuffs and pigments in place of the trade names. It is recognized that in some instances trade names are necessary to avoid lengthy description. Certain trade names have been so widely used as to become generic and these normally are permissable. Further, some technical papers may involve the presentation of a new product or process wherein trade name reference is obligatory.

Giving due consideration to such valid exceptions, it is incumbent upon the author to maintain the proper scientific attitude, avoiding any expressions or devices aimed at promoting a particular product or process.

Questionable papers are to be referred to the chairman of the Publications Committee, who will submit them to an editorial board which would be appointed as needed. The Board would report to the Publications Committee, which would have the final voice in accepting or rejectin a paper.

MANUSCRIPTS — Manuscripts shall be typewritten double-spaced with approximately one-inch margins on 8.5x11-inch white paper. In addition to the *original*, at least one carbon copy is required. Pages are to be numbered consecutively with Arabic numerals, and each page after the first shall carry the authorship at the very top. Tables and figures shall also be numbered consecutively, the tables with headings containing Roman numerals as TABLE I, TABLE II, etc, and the figures with Arabic numerals as Figure 1, Figure 2, etc, appearing *below* the figures. The names of the authors and their laboratories or business connections should appear below the title of the paper.

LITERARY STYLE AND FORM OF PRESENTATION—In the writing of papers, authors are requested to observe a trenchant, simple style of writing directed to textile chemists and colorists with at least an elementary knowledge of chemistry, physics, mathematics, engineering, textile processes and textile machinery.

In the organization of the material, there should be one or more introductory paragraphs setting forth the occasion, significance and main objectives of the paper and of the method of attack. This should be followed by the body of the presentation, either with discussions interspersed throughout this portion or with a collected section marked "DISCUSSION" after the main body of the paper. Finally, there may be a brief section at the end entitled "SUMMARY" or "CONCLUSIONS."

Center and side headings make for easier reading. Center headings should be employed sparingly and generally will include only very important section headings, such as "INTRODUCTION," "EXPERIMENTAL," "DISCUSSION," "CONCLUSIONS," "SUMMARY," and "REFERENCES." Side headings (see sixth paragraph of this *Notice* for an example) shall be indented and run into the text to which they apply, and shall be separated from the paragraph by a dash. The publisher will print center headings in bold-face capitals and side headings in capitals.

LITERATURE REFERENCES AND FOOTNOTES—References to the literature and all footnotes (except those in tables) shall be numbered consecutively with underlined Arabic numerals in parentheses at the proper place in the text. Where a reference or footnote is to be used again, the original number is simply repeated; this obviates the necessity of repeating the footnote or reference at the bottom of the page. References to the literature shall conform to the universal usages followed by *Chemical Abstracts*, which include underlining of journal names to indicate italicization in printing. The abbreviated codes for many journal names appear on page 183 of the 1959 *Technical Manual*.

The spelling and rules of punctuation followed in manuscripts shall be those found in the "Merriam-Webster New International Dictionary"; abbreviations and chemical formulas shall conform to *Chemical Abstracts*.

FIGURE AND GRAPHS—Figures and graphs should be black line drawings on white drawing paper. Photographic prints are acceptable, preferably glossy prints on double-weight paper. Duplicates should be available for dispatch to reviewers. In graphs the frame and actual curves should be inked more heavily than the coordinate lines, and these latter should not be too close together. Various styles of broken lines are sometimes desirable to distinguish curves. Experimental points should be given with small plane figures, such as circles, squares, diamonds, or triangles. Numbers and legends on co-ordinate axes are to be lettered in the graph by the author. Number and titles of figures should be placed below the diagram or on the edge of the back. Each piece of illustration copy should bear on the margin or on the edge of the back the name of the author and the title of the paper.

SYNOPSIS—A separately written synopsis of not over 200 words containing the gist of the subject matter must accompany every manuscript.

GALLEY PROOFS—Galley proofs will be sent to the author by the publisher for correction before publication.

AUTHOR'S COPIES—Fifty copies of papers published in the *Proceedings* will be furnished without charge by the publisher if requested when galley proofs are returned. These copies are printed on one side of the sheet only and then stapled together. A schedule of prices of reprints in the usual form accompanies the galley proofs.

OWNERSHIP OF COPYRIGHTS AND PATENTS—All papers presented at general meetings of the Association or at meetings of any of its local sections and all communications shall become the property of the Association. Such papers are not to be published elsewhere until they have appeared in the *Proceedings* of the Association. Papers published in the *Proceedings* are copyrighted by the Association. Any patentable disclosures shall of course remain the property of the author or authors.

TRADEMARKS—As the AATCC wishes to co-operate in the protection of trademarks, it is requested that, in the body of the article, trademarks be written with an initial capital letter.

IMPORTANT NOTICE

To all manufacturers of Dyes, Pigments, and Resin-bonded Pigment Colors:

To all manufacturers of Textile Chemical Specialties:

The Sections on Dyes and Pigments, Resin-bonded Pigment Colors, and Textile Chemical Specialties in the AATCC *Technical Manual* will be completely revised and brought up to date in the 1962 edition.

Directions for the submission of information and the necessary forms have been mailed to companies whose products were listed in the 1961 edition. If you have not received this material or wish to have your products included in 1962 please notify the undersigned. The material will be sent to you promptly.

To have your products included in the 1962 *Technical Manual* the information we are requesting must be received by the undersigned before the dates given below.

DEADLINES

For Textile Chemical Specialties	January 10, 1962
For Dyes and Pigments	January 20, 1962
For Resin-bonded Pigment Colors	January 30, 1962

William D Appel, Editor, *Technical Manual*
9101 Jones Mill Road, Chevy Chase 15, Maryland

1961 developments from Althouse Research:

COLORFAST DYES IN BRIGHT NEW SHADES THAT REDUCE DYEING TIME AND SAVE REWORK COSTS

NYLANTHRENE® RED 4RL

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Uniform, predictable performance, maximum fastness, excellent covering properties ... you save on dyeing costs when you call Althouse Customer Service 215—FR 4-8275.

ALTHOUSE Chemical Company
Reading, Penna.
a division of Crompton and Knowles Corporation
specialists in colorfast dyes

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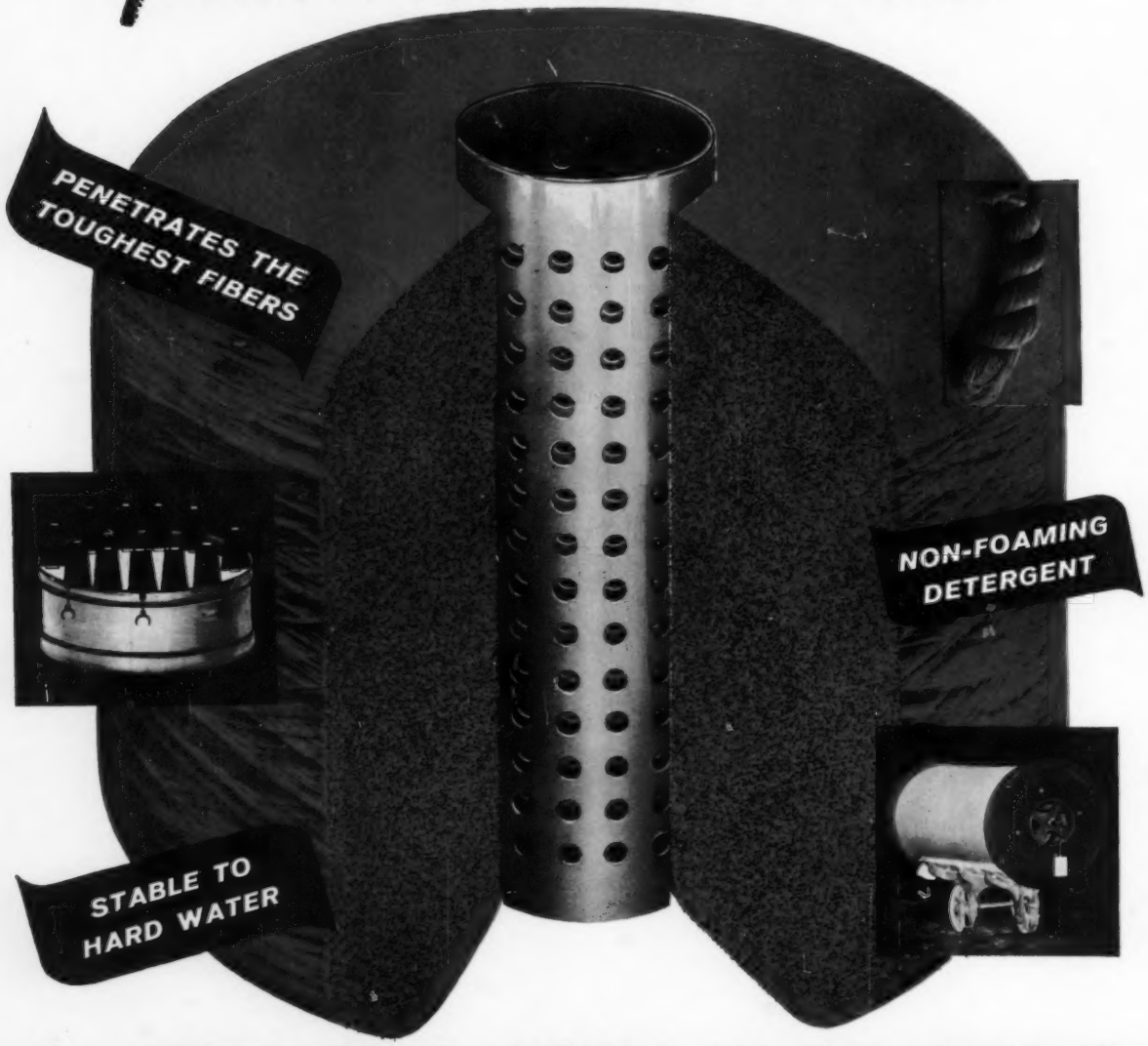
penetrant and leveler



for PACKAGE·BEAM·YARN DYEING

for cotton·nylon·orlon·acetate

CHEMICAL PRODUCTS CORPORATION

Manufacturing Chemists

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ADR News Report:

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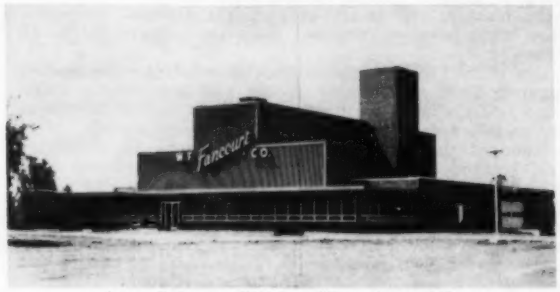
Personalities in the News
New Products, Developments, Processes



New Fancourt Plant at Greensboro, NC

New Fancour Plant One of South's Most Modern

W F Fancourt Co's recently dedicated three-story plant on a 10-acre tract at Greensboro, NC, has been described as one of the most modern of manufacturing plants in the South. Contemporary design keynotes the building constructed of brick with an aluminum curtain wall and windows of solar gray glass.

The new plant, which covers an area of 25,300 feet has been described by North Carolina's Governor, Terry Sanford, as "a well-established, progressive firm that North Carolina can be proud of . . . representing an ideal blending of the old and the new. It will be an important member of one of North Carolina's newest and most rapidly expanding industries: chemicals."

The plant, with advanced laboratory and manufacturing installations designed to double the company's current production output, is strategically located for fast shipping to nearby customers in the heavily populated textile-producing belt. In keeping with the firm's policy, the emphasis on research, production and personal service will be continued.

Fancourt, supplier of chemical specialties to the textile industry for 57 years, was founded by Walter F Fancourt Jr, father of the current president, in Philadelphia. The firm develops and manufactures products designed to provide the textile industry with finishes. It is also actively engaged as a trouble-shoooter in solving the day-to-day problems with which its textile customers are confronted. The largest single area in which the firm has operated is in the hosiery field.

Today, Fancourt reportedly produces finishes for over half of the seamless hosiery manufacturers in the world. In addition to its domestic operations, Fancourt is represented on an international basis by Chemtex Products, Inc, in Toronto, Ontario, Canada; by Paykel Bros, Ltd, in Australia and New Zealand; by A M Romero Corp in the Caribbean and Central and South American areas.

Officers whose new headquarters are in the Greensboro plant are: John L Fancourt, president; Thomas Lindley, vice president: Donald Loeber, office manager; and Claude Wolff, chief chemist.

•

ASTM Changes Name

The name of the American Society for Testing Materials was officially changed to the American Society for Testing *AND* Materials with the recent signing of a court decree amending the Society's Charter originally granted in 1902 by the Commonwealth of Pennsylvania.

In announcing this change, ASTM President Miles N Clair said, "The inclusion of the word 'and' in the Society's name places added emphasis on the Society's research work in seeking knowledge of the nature of materials.

ASTM now has almost 11,000 members including individuals, companies, government agencies, and educational institutions. There are in addition about 7,000 prominent engineers and scientists who serve as representatives of company members on the Society's 87 technical committees.

New Interchemical building in the Arrowood Industrial Development of Charlotte, NC is now completed.

Interchemical Moves Southern Headquarters Into Modern Quarters

Interchemical Corporation's Color & Chemicals Division has announced that its Southern headquarters are now located in modern quarters at 1300 Arrowood Boulevard, Charlotte, NC.

According to the announcement, the newly built Color & Chemicals office-laboratory-warehouse building at Charlotte was designed specifically to provide greater facilities for serving the needs and requirements of textile printers and dyers in the South. Plans provide for ready expansion—if needed, the new building reportedly can be doubled in size.

William B DePass, Southern district manager, and the members of his staff are now operating out of the new headquarters building. The main office and factory of the Color & Chemicals Division is located at Hawthorne, NJ. Another of the Division's branch office, laboratory, and warehouse facilities is located at Pawtucket, RI.

The new Charlotte building also provides greater facilities for two other Interchemical divisions—Printing Ink and Finishes. This is the first time in the Company's history that a building has been erected for the facilities of three Divisions, thus providing a more efficient operation for Interchemical's important southern market.

•

New Installation at De Paul

The De Paul Chemical Co, Inc, 44-27 Purvis St, Long Island City 1, NY, in line with its current expansion program, is completing installation of new stainless-steel tanks and boiler plant. These new installations are designed to greatly expand and improve production facilities.

•

Continental Chemical Celebrating 20th Anniversary with Expansion Program

Continental Chemical Co, Paterson, NJ, is celebrating its 20th anniversary with a sizeable expansion and has acquired a new plant at 270 Clifton Blvd, Clifton, NJ. The new manufacturing and laboratory facilities are approximately three times the present size. Plant and tank storage of raw materials and finished products is planned in a volume of 50-75,000 gallons when the entire installation is completed. The new plant occupies a large site to provide for considerable future expansion during the next forty-month period. The general offices, quality control, and research laboratories are centrally air conditioned and although the entire building is on one level, manufacturing sections are up to three floors in height to provide for gravity feed operations. A six-car railroad siding has been provided to facilitate bulk shipment of finished products as well as receiving raw materials. The railroad siding runs directly into the loading area which is all truck-level height.

Continental manufacturers, and markets a broad range of surface-active agents including alkyl aryl sulfonates, alkanolamides, alkyl sulfates, emulsifiers and wetting agents, auxiliaries and specialties for the dyestuff, textile processing, soap and other industries.

Continental Chemical Co expects to be in its new quarters by December 1.

NEW TOOLS FOR SPINNING FIBERS—Southern Research Institute facilities for wet, dry, and melt spinning of synthetic fibers. Technicians pictured are Jerry L Dollar, left, and Thomas B Cole.

SRI Installs New Fiber-spinning Equipment

Unique tools for the study of new polymers have been added to the expanding textile laboratories at Southern Research Institute, Birmingham, Ala.

Facilities for wet, dry, and melt spinning of synthetic fibers, capable of producing monofilament yarns, have been installed to permit evaluation of the fiber-forming characteristics of new polymers or modified forms of existing polymers.

The equipment is adapted for spinning such materials as polypropylene, polyethylene, nylon, polyesters, cellulose acetate, acrylic polymers and polyvinyl alcohol. Polymer batches as small as 25 grams may be spun.

Built by Institute personnel, the equipment will be valuable in studying the fundamental relationships between chemical structure and fiber properties—crystallinity, orientation and other morphological properties.

It may be used for special problems, for example, to study the effects of additions of other polymers to polypropylene to provide dyeability.

Another use would be to study new finishes, antistatic agents or germicides added to the polymer before fiber formation.

●

10th Chemical Finishing Conference

The cotton chemical industries may be on the threshold of a new research development which will be as important as the development of 'wash-wear' cottons ten years ago, scientists at the National Cotton Council's tenth annual Chemical Finishing Conference were told.

The program for the Conference was keyed to discussion of basic research on cotton finishes. The meeting highlighted reports on latest developments in crosslinking, "wash-and-wear," all-cotton stretch yarns, and stain-resistant treatments.

The Conference, sponsored by the National Cotton Council, was held at the Sheraton Park Hotel in Washington on November 8 and 9. Godfrey S Rockefeller, president, National Association of Finishers of Textile Fabrics, and also president, Cranston Print Works Co, New York, served as conference chairman.

Cotton fabrics with durable loft, warmth and recoverable stretch have been produced in the laboratory and are headed for commercial development, according to Mr Rockefeller.

Chairman of the opening session was Guiliana Tesoro, assistant director of research, Central Research Laboratory, J P Stevens & Co.

At this session Emery Valko, Lowell Technological Institute Research Foundation, discussed "Wet-only Wrinkle Recovery by High Temperature Cure." Following his talk, Robert A Gill, Research Laboratories, Rohm & Haas Co, reported on "Effect of Humidity on Crease Recovery of Modified Cottons."

This session also included "Chemical Bonding of Wrinkle-resistant Finishes in Cotton," by S James O'Brien, American Cyanamid Co.

Chairman of the afternoon session on November 8 was Henry Tovey, National Cotton Council. "All-Cotton Stretch and Bulked Yarn and Fabrics," was discussed by C H Fisher, director, Southern Utilization Research & Development Division, US Department of Agriculture.

Research in finishing has shown that chemicals used to set a fabric in a flat, wrinkle-resistant fabric also can be used to produce cottons having high stretch, durable loft, bulk, texture, warmth and other highly desirable properties. How these new cottons are made was described by Dr Fisher.

One of the most promising methods involves resin treating highly twisted cotton yarns, curing, and then reverse twisting. This produces a kinked yarn which can be knitted or woven into garments having high recoverable stretch.

Some of the markets for stretch cottons he listed are knit bathing suits, knit dresses, hosiery, foundation garments, sweaters, knit shirts, furniture slip-covers, casket lining and covering materials, bandages, gauzes and sponges, automobile seat covers, linings and upholstery, hand luggage covering, and meat stockingettes.

"The commercial manufacture of elastic cotton fabrics was announced a few months ago," Dr Fisher said. "Probably other highly elastic cotton fabrics which can be subjected to repeated stretching without bagging or sagging, will appear soon.

"Work on the development of warm cotton fabrics with loft and durable, low-weight bulk is well under way in several laboratories and it should not be very long before these new fabrics will become commercial realities," he said.

Cottons with improved warmth could result in a three-quarters of a million bale increase in cotton consumption through items such as robes, coats, jackets, gloves, suits skirts, dresses, sweaters, trousers, slacks, and blankets, he said.

Dr Fisher was followed by John F Krasny, Harris Research Laboratories, who covered "Fabric Construction for 'Wash-and-Wear' Cottons." S P Hersh, Research Department, Union Carbide Chemicals Co, concluded the session with a paper on "Effects of Tension in 'Wash-Wear' Finishing of Cotton."

The final session was chaired by Allan J McQuade, chief, Textile Functional Finishes Branch, Quartermaster Research and Engineering Command. Wilson Reeves, chief, Cotton Finishes Laboratory, Southern Utilization Research and Development Division, discussed "Acid Hydrolysis of N-Methylol Finishes."

"Prevention of Bleach-Induced Yellowing of APO-Finished Cotton," was discussed by R B LeBlanc, Organic Process Development Laboratory, The Dow Chemical Co.

William H Petersen, Chemical Division, Minnesota Mining & Manufacturing Co, described "Oil- and Water-Repellent Fluorochemical Finishes for Cotton." These cotton finishes, now reaching the market in quantity, are said to be the only known chemicals which impart oil repellency. They are being used for treating apparel and furniture fabrics to resist oil and water-bourne stains.

●

Group Portrait of Dye Industry Founders Presented to LTI

A valuable oil painting, believed to be the only group portrait of Hofmann, Graebe and Libermann, founders of the dyestuff industry after Sir William Henry Perkin discovered the first synthetic dye, has been presented by Sidney M Edelstein, president of Dexter Chemical Corp, to Lowell Technological Institute, where it will be placed in the Alumni Memorial Library.

Painted in 1869 by Anna Lee, an American studying art in Paris who later married an Englishman and carried on her art career in London, the 54- by 65-inch oil is furnished with a gold frame 66 by 77 inches and is outstanding in that it depicts many bottles of chemicals and samples of fabrics in colors.

The three subjects, noted chemists, were brought together and assembled for the painting by Miss Lee's father, who was interested in dyestuffs, particularly in the artificial dye industry which was growing up in Germany.

Some of the artist's work is to be seen in the Royal Academy Collection in London. The portrait which Dr Edelsein has presented to LTI was restored by the Museum of Fine Arts in Boston.

REPRINTS

from AMERICAN DYESTUFF REPORTER

The following technical articles—reprinted from recent issues of American Dyestuff Reporter—are available in limited quantity, at prices shown. Send check, money order, or stamps to address below:

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Five versatile Cibalan® Dyes for those hard-to-dye Red to Yellowish Browns

You've been through it so many times . . . trying to achieve that exact degree of shading on woolens in the field of lighter browns. Somehow the deeper shades that lead to dark blues and charcoals are usually less trouble to match. Success with the light browns, as well as the darks, can be achieved, and with less difficulty than you might expect, with the five Cibalan Browns listed below. When you work with them, you'll appreciate their ease of application and excellent fastness . . . plus the fact that for woolen suiting material of various qualities, they provide you with unusually fine results.

Incidentally, the Cibalan dyes listed below exhibit a standard of fastness which can be compared to that of chrome dyes, yet do not require strong acid dye baths or the usual chrome treatment.

Cibalan Brown BL
Cibalan Brown 2 GL
Cibalan Brown TL
Cibalan Brown 2 RL
Cibalan Red Brown RL

May we suggest you get full technical information on one or all of these products by contacting your CIBA representative or writing direct to CIBA Company, Inc., Fair Lawn, New Jersey.

C I B A

Eastman Announces Construction of Process Development Laboratory for Organic Chemicals and Acids

Tennessee Eastman Company announced November 10 the construction of a new development laboratory building for the Organic Chemicals and Acid Divisions at Kingsport, Tenn.

The new laboratory facility, scheduled to be completed in the Spring of 1962, is a part of Eastman Kodak Company's 1961 capital expenditure budget program. Kodak's capital budget covers a number of construction and modernization projects at various company locations.

The two-story, 48,000-square-foot laboratory building will contain facilities for laboratories, departmental offices, a library, conference rooms, locker rooms, and a chemical storage area. The building, designed to accommodate future third and fourth floors, will be air conditioned and lighted throughout with diffused fluorescent fixtures. There will also be a separate autoclave section. The basement area is designed to provide additional laboratories at a later date.

Housed in the building will be the development staffs and instrumental methods groups of both the Acid and Organic Chemicals Divisions.

The new laboratory will be concerned with processes involved in the manufacture of ester and ketone solvents, dye intermediates, food-grade antioxidants, gasoline additives, plastic inhibitors and stabilizers, plasticizers, and Eastman's line of organic acids, anhydrides and aldehydes.

Quality control laboratories for the two divisions will remain in their present locations.

●

Revised Textile Standards from ASA

Availability of four revised American Standards in the textile field, including colorfastness to perspiration, has been announced by the American Standards Association.

Developed by the L14 sectional committee under the administrative sponsorship of the American Association of Textile Chemists and Colorists and the American Society for Testing Materials, the revised standards are: "American Standard Colorfastness to Perspiration, L14.56-1960," "American Standard Colorfastness of Dyed Textiles to Atmospheric Oxides of Nitrogen, L14.54-1960," "American Standard Resistance to Wetting (Static Immersion Absorption Test), L14.61-1960" and "American Standard Resistance of Textiles to Insects, L14.64-1960."

Copies of the revised standards are available from the ASA, Dept P266, 10 East 40th Street, New York 16, NY. American Standard L14.64-1960 is available for 50 cents a copy while the remaining three standards sell for 40 cents per copy.

●

Stevens Offering Patent License to Finishers

Paul B Stam, director of research, J P Stevens & Co, Inc, has made known that Stevens is making available to finishers a patent license under USP 2,524,399.

Stevens Research Division, which has been working in the areas of sulfones that are useful for producing nonresinous, nonchlorine-retentive "wash-and-wear" finishes, has patent rights covering the crosslinking of cotton or rayon with sulfone chemicals.

At a recent meeting of the Fiber Society, Giuliana C Tesoro, assistant director of research, J P Stevens & Co, Inc, discussed polyfunctional sulfones as a new and broad class of crosslinking agents for cellulose.

It was reported that "wash-and-wear" finishes produced under this patent license have exceptional permanency under all normal washing conditions with wet and dry crease recovery properties for good line drying and tumble drying.

●

TB& C Announces Change in SMA Resin Price

Texas Butadiene & Chemical Corp, New York, NY, has announced lower prices for its SMA resins. SMA 3000A is now offered at 49 cents per pound delivered. All other anhydrous polymers in the SMA resin series are now priced at 54 cents per pound delivered. The Company stated that it has lowered SMA prices to broaden the potential applications for the resins.

SMA resins, low-molecular-weight styrene-maleic anhydride copolymers, have demonstrated their usefulness in emulsion polymerization. A number of other applications are under investigation.

NAMES IN THE NEWS

John M McChesney Jr, president of Leatex Chemical Co, Philadelphia, was elected president of the Textile Chemical Manufacturers' Association at its recent annual meeting.

Elected as vice president was *Fritz O Robitschek*, president of Onyx Chemical Corp, Jersey City, NJ; named as secretary-treasurer was *William H Bertolet 3rd*, Laurel Soap Manufacturing Co, Inc, Philadelphia.

The sessions gave particular attention to world problems as they affect the textile industry. Discussions included proposals to combat the increasing competition from foreign nations in the world markets, and ways to strengthen the domestic position against competitive imports.

The Association agreed to hold a special session in New York City during the coming winter on a date to be announced later by Mr McChesney. All manufacturers within the textile chemical industry will be invited to attend for a united effort to meet economic problems in the common interest.

●

Tigler

Keels

American Finishing Co, Memphis, Tenn, has announced two new additions to its recently expanded technical staff.

Leon Tigler has been named assistant director of research and development and *Harold Keels* superintendent of dyeing.

Before joining American Finishing Co, Mr Tigler was, for five years, technical superintendent of the cotton finishing division of Eagle & Phenix Division of Reeves Brothers. Before that he was a chemist, for seven years at the Kerr Bleachery. Mr Tigler is vice chairman of the Southeastern Section, AATCC. In his new assignment, he will work with *Charles J Chaban*, who joined American Finishing Co earlier this year as director of research and development.

Mr Keels had been with the North Carolina Finishing Co for over 10 years before joining American Finishing.

●

Arthur Minich was recently named president of the Heyden Chemical Division of Heyden Newport Chemical Corp, succeeding *R M Aude*, who died on August 20. Since 1955 Mr Minich has been president of the Nuodex Products Division of Heyden Newport.

●

Paul F Wilson Jr has joined Ciba Co, Inc as technical supervisor, chemical specialties laboratory, Charlotte, NC, district office.

Mr Wilson was with Callaway Mills Company, La Grange, Ga, as research chemist (1957 to 1961) and with Olin Mathieson Chemical Corp, Saltville, Va (1952 to 1955) as assistant superintendent of the Dry Ice Plant.

●

The Hart Products Corp, New York, NY, has announced four additions to its staff.

Guy Thompson has been appointed sales manager. Mr Thompson was formerly technical sales manager for the Cuban Rayon Co. Basically, Mr Thompson's duties are to accelerate the company's program on rayon oils.

Theodore B Manheim has been appointed to head the Technical Sales and Development Department for Textile and Paper Industries. He previously held technical sales and development positions with Tanatex Chemical Corporation and Ciba Co, Inc.

William Green has been appointed technical sales representative and demonstrator for the leather industries.

David Waldstein has been added to the laboratory staff as head of the New Products Development Department. Mr Waldstein formerly held positions as research and development chemist with US Cotton Oil and many chemical concerns in Germany.

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OF THE SECOND EDITION

COLOUR INDEX

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Your prepaid subscription received promptly will insure your possession of this LIMITED EDITION, a tremendously valuable work on the free world's dyestuffs and pigments in commercial use. Published by The Society of Dyers and Colourists and the American Association of Textile Chemists and Colorists, these four volumes totaling 3152 pages provide the only complete reference of coloring matters available to those interested in this field. They include information on methods of application and fastness properties of coloring matters furnished by world manufacturers, chemical and structural information, characteristic reaction, index of products and trade names, fastness tests and rating methods, new and old COLOUR INDEX NUMBERS, Schultz and AATCC prototype numbers and a hue indication chart.

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American Association of Textile Chemists and Colorists
PO Box 28, Lowell, Massachusetts

Orders in other countries should be placed with—

The Society of Dyers and Colourists
19 Piccadilly, Bradford, Yorks, England

Nonwoven Fabrics—New Market for the Textile Industry

Sherwood, P W, *Can Textile J* 78, 41-4, August 18, 1961

The author points to three key advantages which make nonwovens attractive in today's technology: 1) they are potentially a low-cost means of converting fibers to fabric; 2) they permit production of fabrics with an unusually wide range of properties; 3) nonwoven techniques permit upgrading of fibers which cannot be utilized by spinning methods (ie, fibers less than one-half inch in length.

A fourth factor, which is taking on growing importance, is the adaptation of paper-making machinery to the manufacture of nonwovens at velocities as high as 1200 feet per minute.

In terms of total textile output, nonwovens still represent a small but rapidly growing factor. Production in 1960 constituted about 2% of total textile volume.

End-uses for nonwoven textiles may be classified into three major categories: durables, semidurables, and disposables. Biggest factor today are durable uses—thermal insulation, wall covering, apparel interlining, air filters, shoe interlinings, backing for vinyl-coated fabric and vinyl film. The latter application is particularly significant for automobile seat fabrics and has been adopted by several leading U S automobile makers.

Semidurable uses for nonwovens include vacuum-cleaner bags, polishing cloths, and window drapes. Disposable nonwovens serve in napkins, medical dressings, guest towels, etc.

The role of the various fibers in nonwovens has been characterized as follows:

Wool is expensive and tends to shrink.

Cotton provides a soft, flexible and relative bulky hand.

Viscose rayon imparts a high sheen, which is used particularly in draperies. The product is soft and absorbent. Rayon is available in various grades (from 1 to 100 den) and lengths (¾″ to 7″). Also available is a crimped staple, used in shoe liners.

Acetate is used for its thermoplasticity and resistance to biological attack.

Nylon has high abrasion resistance and strength. It has found wide application.

Dacron is favored for its good appearance, especially when short fibers are used. A low-melting polyester can be used as binder for both Dacron fiber and other material.

Generically speaking, wholly synthetic fibers offer high strength, good chemical and electrical resistance, high resilience and resistance to creasing. Their chief drawback is high price.

There is a wide variety of binders used on nonwovens. Water-soluble resins serving as binders include polyvinyl alcohol and sodium alginate. Aqueous emulsions, which are commercially the most important binders, include polyvinyl chloride, polymers of acrylate esters, and various polymer latices.

While liquid binder systems are the most important, two methods of applying binders in solid form are also employed: powder bonding and fiber bonding. Either thermoplastic (acrylic and vinyl) or thermosetting (phenolic) resins may be applied in powder bonding.

The use of fiber binders is more important, however. Theromsetting fibers have been used, but the thermoplastic fibers are more common.

The author discusses the binder problem at some length, and concludes that "the ideal binder for nonwovens is not yet at hand." He lists the chief characteristics required in such a binder.

●

The Development of a New Shrink-resist Finish for Wool

Davidson, A N, *J Soc Dyers & Col* 77, 409-15, Sept, 1961

Since the observation by Knecht in 1892 that wool loses its power to felt after treatment in an aqueous solution of chlorine, the reaction between wool and chlorine has received considerable study. Many modifications of the original process have been made, and the development of other types of process for the production of shrink-resisting wool has resulted. These methods have included treatment with chlorine gas at reduced and atmospheric pressure; caustic alkalis in nonaqueous solvents; reducing compounds in presence of proteolytic enzymes; oxidizing agents (other than halogens), eg, hydrogen peroxide in presence of traces of metals; potassium permanganate before or after treatment with reducing agents, or in presence of sodium hypochlorite or common salt; sodium chlorite followed by chlorine or by papain in sodium bisulfite solution; peracetic and permonosulfuric acids; and resins of various constitutions, including resins as a reservoir for chlorine in aqueous chlorine baths.

To be wholly satisfactory, a shrink-resist for wool should a) produce a high degree of unfeltability with the minimum of chemical attack on the fibers; b) neither discolor nor alter the handle of the fibers; c) give levelness of treatment, including reproducibility of the result; d) be suitable for, and applicable to, wool in different forms; e) not give rise to any obnoxious smells or attack normal machinery; f) have no effect on dyes; and g) have a low processing cost and be easily fitted into the normal plant routine.

The author considers that, judged by the above criteria, no process being used at present is wholly satisfactory.

Experiments conducted with various per-salts are described. These led to the development of an improved shrink-resist method, in which the wool is treated with a mixed solution of peracetic acid and sodium hypochlorite. It was found that the degree of unfeltability produced by this process depends on the concentration of both reagents, that of sodium hypochlorite having the greater effect; if a ratio of 1:2 was maintained between the peracetic acid and the chlorine equivalent of the sodium hypochlorite, the best results were obtained, as judged by unfeltability, color, and handle.

A final clearing treatment with sodium bisulfite removes any excess of reagent.

The author discusses the application of this new method to wool in various forms (eg, hosiery, hanks, and packages). He cites as its main advantages the following:

No special plant is required, and all the processing may be carried out in the cold.

The control of the process depends simply on a chemical analysis of the reagents, the pH of the solution, and the temperature.

It is cheap to use, and no softening agent is required.

No loss in weight of the material occurs during processing, apart from normal scouring losses.

No obnoxious smells are caused, and the process may be carried out in ordinary scouring or dyehouse sheds without the use of exhaust fans.

Twenty-six references to the literature are cited.

TECHNICAL LITERATURE

(Literature is available from sources listed in italics)

AUTOMATIC FILLING BALANCES——*Mettler Instrument Corp, P O Box 100, Princeton, NJ*——A new line of low-weight-range filling balances which automatically weigh out granular or powdered substances is described in Bulletin No. 102A. The instruments operate in the range of 100 milligrams to 200 grams, at speeds to 900 per hour. The DWA system weighs out free-flowing powdered or granular materials, providing accuracies up to plus or minus five milligrams.

The literature describes how the system may be used for accurate packaging of finished products in the chemical and other industries, as well as in the mixing processes of dyes and chemical additives.

•

BULK HANDLING OF STARCH——*Fuller Co, Catasauqua, Pa*——How Springs Cotton Mills, Lancaster, SC, reduced its cost for starch and eliminated waste by switching from palletized to bulk handling is described in Fuller Fact File ER-2046-2.

This four-page technical report tells how Springs supplies starch to seven separately located mills by a bulk delivery trailer equipped with a pneumatic conveying system.

Photographs illustrate how two men can load the 25,000-lb capacity trailer in little over a half-hour and transfer the load to a mill storage silo in about the same time.

The report gives details on sizes of pneumatic handling components and handling capacities.

A full page is devoted to drawings and brief descriptions of Fuller pneumatic handling systems and other equipment for the process industries. Another page lists the complete line of Fuller products.

•

CONTROL OF SODIUM HYPOCHLORITE BLEACH BY OXIDATION-REDUCTION POTENTIAL——*Bristol Co, Waterbury 20, Conn*——Sodium hypochlorite bleach liquor (NaOCl) is manufactured for use by the textile and other industries. Preparation can be by either the batch or continuous system with end-point control based on oxidation-reduction potential (Redox) measurement.

Application data No. 073.7-2 defines the problems involved in the manufacture of sodium hypochlorite by both process systems, and graphically illustrates process control instrumentation systems presently employed.

•

CONTROLLED FEEDING OF LIQUIDS AND SOLIDS——*B-I-F Industries, PO Box 276, Providence 1, RI*——Feeding, weighing, blending and proportioning equipment for the controlled feeding of liquids and solids in process industries is discussed in Bulletin Ref. No. 4.20-1. According to B-I-F, manufacturers of equipment and systems for positive control of materials flow, process control involving either a single unit or a fully integrated system, can be effected to handle both simple and hard-to-handle materials, from soda ash and industrial alcohols to liquid latex, carbon black and rocket propellants.

The continuous, accurate and dependable feeding and blending of liquids are said to feature such products as the Proportioneers pumps, for volumetric feeding of toxic, explosive or corrosive liquids and suspensions; the Omega Rotodip for wide-range feeding of slurries, low viscosity or corrosive liquids; the Proportioneers Blendamatic and Two Component Blenders, for continuous, in-line blending of components without intermediate mixing or storage.

Feeding of a wide variety of solid chemicals either volumetrically or gravimetrically include such products as the Omega compact, screw-type dry feeder for constant-rate feeding; the Omega Table Model Feeders, for low-filling, low-power requirements of pulverized, floodable or granular solids; the Omega Belt Feeders and Weighers for continuous gravimetric feeding of dry solids.

The eight-page, multi-colored bulletin contains descriptive material, photographs, schematics of typical process systems and a listing of industrial systems contained within the application range of B-I-F equipment.

(continued on page 61)

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WANTED: MAN FOR DYEHOUSE LABORATORY, with knowledge of procedures for dyeing cotton yarn on packages. State experience, age and salary expected. Location, Delaware Valley area. Write Box No. 255

WANTED: SALESMAN—Chemical manufacturer producing basic type detergents seeks experienced salesman for the textile industry for the New Jersey, New York and Pennsylvania area. Must have thorough experience in textile dyeing processing methods for all types of goods. Write Box No. 256

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POSITION WANTED: SUPERINTENDENT—DYEING AND FINISHING. Experience: sweaters, piece goods, ladies' and men's hosiery. All fibers, fabrics and blends. Write Box No. 250

Technical Literature———

(concluded from page 59)

CSC METHYLAMINES———*Commercial Solvents Corp, 260 Madison Ave, New York 16, NY*———64-page booklet contains a review of available technical data on the methylamines, with full discussions on shipping, handling, storage, and safety. Specification test methods for monomethylamine, dimethylamine, and trimethylamine are presented in detail.

•

HOOKER CHEMICALS———*Hooker Chemical Corp, Niagara Falls, NY*———Bulletin 100-E, the 1961 edition of "Hooker Chemicals," lists and describes the firm's 108 organic and inorganic chemicals for industry and agriculture.

The new 16-page digest covers 87 chemicals produced in commercial quantities, 14 market-development products available in semicommercial quantities, and seven product development chemicals in research or pilot-plant quantities.

Described in the bulletin are acids and alkalis; the elements chlorine, and phosphorus; metallic salts, phosphorus compounds, sulfur compounds, chlorides, chlorobenzenes and other chemicals produced by Hooker's Eastern Chemical, Western Chemical and Phosphorus Divisions.

Each chemical is listed with a brief general description, an outline of its physical data, a concise description of its uses, and a designation of the type and weight of the container in which it is shipped.

•

LUNKENHEIMER TOP-ENTRY BALL VALVES———*Lunkenheimer Co, Cincinnati 14, O*———Designed for corrosive fluids, gases, and general corrosive services, the new Lunkenheimer Type 316 Stainless Steel Ball Valve is described and detailed in a new full-color catalog sheet. Circular 612 describes the operation of the valve, shows cutaway views, gives pressure ratings, covers specific design and dimensions, reports on applications and advantages.

•

METHYL ETHYL KETONE———*Manufacturing Chemists' Assoc, Inc, 1825 Connecticut Ave, NW Washington 9, DC, $.30*———Chemical safety data sheet SD-83 details properties, hazards, engineering control of hazards, employee safety, fire fighting, handling and storage, tank and equipment cleaning and repairs, waste disposal, medical management and first aid.

The pamphlet describes Methyl Ethyl Ketone as a flammable liquid with a low flash point, the vapors of which form explosive mixtures with air. SD-83 points out that although industrial use of this chemical does not present a serious health hazard, undesirable effects may occur from inhalation of excessive concentrations of vapor, prolonged or repeated skin contact with the liquid, and from contact of the liquid with eyes.

•

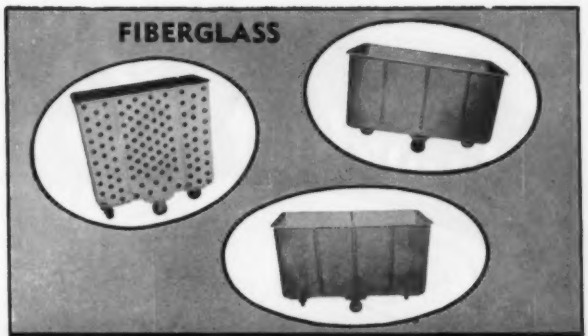
PRESSURE TRANSMITTERS AND TRANSMITTING MECHANISMS———*Bailey Meter Co, 1050 Ivanhoe Rd, Cleveland 10, O*———Three new illustrated product specification sheets describe Bailey differential pressure transmitters, pneumatic pressure transmitting machanisms and electrical pressure transmitting mechanisms.

The four-page product specification (G21-4), which describes Mini-Line differential pressure transmitters for transmitting differential pressure measurements to indicating, recording, and/or controlling equipment at remote locations, includes applications, features and characteristics. Also included are tables which show ranges and types of equipment for specific applications.

The two two-page specification sheets (P21-4) and (E21-4) describe respectively pneumatic pressure transmitting mechanisms and electrical pressure transmitting mechanisms include applications, standard ranges available, operating characteristics, indicating scales, physical characteristics, and theory of operation. Receivers are also discussed and illustrated.

•

TWITCHELL LUBRICANTS FOR FIBER PROCESSING———*Emery Industries, Inc, Dept 5, Carew Tower, Cincinnati 2, Ohio*———Technical Bulletin No. 414A on the company's line of Twitchell lubricants for woolens, worsteds, and blends with synthetics, discusses each of the three lubricants in the line, Twitchell 7440, new Twitchell 7428, and Twitchell 7421, and lists performance data and recommended applications. Viscosity studies on emulsions of the lubricants are also included.



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Mercerization of Cotton Fibers without Tension———

(*concluded from page 31*)

the denier were increased, but the tenacity of the single fibers was decreased. The maximum shrinkage was about 15%, and the increase in elongation at break was from 7.5% for the untreated fiber to 12% for the mercerized fiber.

It was found that card sliver was the best form in which to mercerize the fiber, and a continuous procedure utilizing a series of wash boxes in a dyeing range, with the sliver supported between two wire screens, was developed. Utilizing the cotton sliver mercerized in this way, a manufacturing organization for yarn was developed. It was found that the yarn spun from mercerized sliver showed high elongation and better strength and appearance than that spun from untreated cotton. The increase in elongation of the single fibers mercerized without tension was not completely utilized in the yarn made from these fibers, the maximum elongation of the yarn being 10.7%. Studies of the recovery behavior revealed that the yarn made from the untreated fibers was superior to the yarn made for the mercerized sliver. In all respects the same conclusions were reached with regard to yarn properties, whether singles yarns or ply yarns were used.

Both knitted and woven fabrics were made from various yarns and their properties compared. No definite conclusions could be drawn relative to the comparative strengths of the various fabrics. Considering the data obtained by different methods of evaluation, strengths appeared to be very nearly the same for all materials.

The receptivity of the fabrics to resins and dyes was determined. It was concluded from these experiments that no particular advantage with respect to resin treatment or dyestuff receptivity was gained by bulk fiber mercerization.

ACKNOWLEDGMENT

The authors gratefully acknowledge the valuable assistance of Carroll L Hoffpauir, James N Grant, and B M Kopacz in revising the manuscript. Their suggestions resulted in the shortening of an otherwise lengthy paper.

The authors wish to give credit to John Glenn Templeton for the development of the continuous method for the mercerization of cotton sliver.

The authors are also indebted to Dan River Mills and H Y Jennings for the commercial application of resin finishes to the various fabrics.

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BOOK REVIEWS

Dictionary of Dyeing and Textile Printing

Authors: H Blackshaw and R Brightman
Published by: Interscience Publishers, Inc (1961)
New York,
NY
pp: 221
Price: $5.75

"Apart from providing concise definitions of the many terms used in textile dyeing and printing, special attention has been paid to chemical compositions by the use of formulae and diagrams. An important feature of this dictionary is the use of drawings to illustrate some of the more complex textile processes." Also included in this hard-cover, pocket-size (5" × 7½") dictionary is an extensive reading list and list of man-made fibers in commercial production throughout the world.

•

Water Treatment for Industrial and Other Uses———2nd Edition

Author: Eskel Nordell, director of technical information, The Permutit Co
Published by: Reinhold Publishing Corp (1961)
New York,
NY
pp: 608
Price: $12.00

In 1951 Eskel Nordell published the first edition of this book and it was recevied with praise by the industrial world. Since that date, tremendous advances have been made in commercial, institutional and municcipal water conditioning, and in desalting sea and brackish waters. The author, who has spent a lifetime studying water and its impurities both here and abroad, has brought this practical reference on water treatment up to date in this second edition of his renowned work.

•

Invitation to Chemical Research

Author: E Emmet Reid
Published by: Franklin Publishing Co, Inc (1961)
Palisade,
NJ
pp: 365
Price: $10.60

This is one of those rare books that inspires as it instructs. It is a "how to do it" book by a man who spent a lifetime in chemical research. Some of the illuminating chapter heading are as follows: Libraries, Use of Chemical Literature, Primary Publications, Soviet Chemical Literature, Secondary Publications, Searching the Chemical Literature, Patent Searches, Reporting Results, as well as other practical chapters where one finds words of encouragement such as the following quotations.

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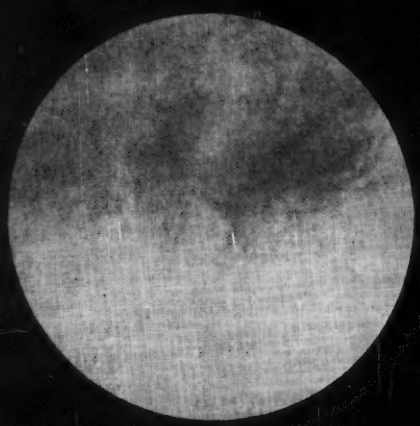

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